

HP SureStore E Tape Library 20-Slot, 40-Slot, and 60-Slot Models

User's Guide

Edition 3



**Manufacturing Part Number: C9521-90051
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Printing History

New editions of this manual incorporate all material updated since the previous edition. The manual printing date and part number indicate the current edition. The printing date changes when a new edition is printed. (Minor corrections and updates incorporated at reprint do not change this date.)

Edition 1:	June 1999: C7200-90050 Initial Printing.
Edition 2:	April 2000: C7200-90051 Updated Fibre Channel, remote management card, and front panel information.
Edition 3:	December 2000: C9521-90051 Added the reader comment sheet and drive appendix. Updated the troubleshooting procedures, technical specifications, Fibre Channel configuration, remote management card features, mailslot options, front panel, and customer support information.

Updates

For the most current version of this manual and other information regarding your tape library, visit the HP Customer Care website:

www.hp.com/go/support

Typographical Conventions and Terms

Keycap: Menu choices and screens on the library.

[Soft Key]: Soft keys to press on the library.

Indicates the menus you need to enter on the library front panel:

Main Menu ->

Operations ->

Drive and Tape Operations

WARNING

Warnings call attention to a procedure or practice that could result in personal injury if not correctly performed. Do not proceed until you fully understand and meet the required conditions.

CAUTION

Cautions call attention to an operating procedure or practice that could damage the product if not correctly performed. Do not proceed until you understand and meet these required conditions.

NOTE

Notes explain significant concepts or operating instructions.

TIP

Tips provide hints or shortcuts for a procedure.



This symbol stands for “*information*” and indicates the location of product ratings and safety/regulatory information. This information is located on the back of the library on the pull-out tabs.

The term “*level*” helps identify the three models of libraries. The 20-slot library has one level, the 40-slot has two levels, and the 60-slot has three levels.

In This Manual

Chapter 1	Library Installation: Describes how to install, rackmount, connect, and power on the library.
Chapter 2	Library Operations: Describes the front panel menu structure, menu trees, and drive and tape operations.
Chapter 3	Library Administration: Describes configuration options, diagnostic tests, and retrieving information about the library.
Chapter 4	Troubleshooting, Removal, and Replacement: Describes how to troubleshoot library problems, resolve error conditions, remove/replace parts, and download firmware.
Appendix A	Technical Specifications: Describes environmental, library, physical, SCSI cable, and Fibre Channel cable specifications.
Appendix B	Customer Support: Includes support information for the library.
Appendix C	Introduction to Fibre Channel: Describes Fibre Channel technology, terms, and using Fibre Channel with HP tape libraries.
Appendix D	Drives and Media: Includes information on drives and media to assist in using, maintaining, and troubleshooting the library.
Glossary	Glossary: Includes technical terms used in this manual.

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1 Library Installation

Chapter Overview

This chapter describes the following:

- Identifying Product Components
- Choosing a Location
- Installing the Library into a Rack
- Preparing the Host for Installation
- Connecting and Powering on the Library
- Configuring the Host System
- Identifying the Post-Installation Tasks
- Moving or Shipping the Library

Identifying Product Components

The components listed in Table 1-1 may be supplied with the library, depending on the library configuration.

Table 1-1 **Supplied Components**

Component	Description
SCSI interface cable	Four-meter SCSI cable(s) with 68-pin connectors.
SCSI terminator	68-pin SCSI terminator (HVDS or LVDS) to terminate the SCSI chain.
SCSI jumper cable	68-pin cable that connects the library controller or Fibre Channel interface to a drive.
Fibre Channel cable	Optical short-wave cable (16 meters) that connects the Fibre Channel interface to the host, hub, or switch (<i>for Fibre Channel configurations</i>).
Fibre Channel GBIC	Connects the Fibre Channel cable to the host, hub, or switch. (<i>For Fibre Channel configurations with standard performance Fibre Channel interfaces only. See page 4-23 and page 4-24 for descriptions.</i>)
Power cord	Localized power cord(s).
Data cartridges	Data cartridges included for data backup.
Cleaning cartridge	Cleaning cartridge used when cleaning a drive.
Label kit	Bar code labels for data and cleaning cartridges, and reordering information.
User manual	Printed English user manual describing installation, operations, and troubleshooting.
Quick setup poster	Overview of installation and configuration procedures.

Table 1-1 **Supplied Components**

Component	Description
Miscellaneous information	May include data sheets, upgrade information, product information, and additional promotions.

NOTE	For information on additional accessories and upgrade kits, visit the HP Customer Care website at www.hp.com/go/support .
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Choosing a Location

Choose a location that meets the criteria listed in Table 1-2. For additional specifications, refer to Appendix A or the product information labels located on the back of the library.

Table 1-2 **Location Criteria**

Room temperature	10-35° C (50-95° F)
Power source	• AC power voltage: 100-127 V or 200-240 V Autoselecting • Line frequency: 50-60 Hz • A dedicated circuit is required.
LAN connection	Locate the library near a LAN connection for connecting the remote management card.
Air quality	Minimal sources of particulate contamination. Avoid areas near frequently used doors and walkways, stacks of supplies that collect dust, and smoke-filled rooms. CAUTION: <i>Excessive dust and debris can damage tapes and tape drives.</i>
Humidity	20-80% RH

Table 1-2 **Location Criteria**

Clearance	<i>Stand-alone configuration — located on or below a table:</i> Back: 56 cm (22 inches) for cooling and service. Front: 86 cm (34 inches) for operator access. Sides: 56 cm (22 inches) for removal of the external cover.
	<i>Rackmounted configuration:</i> Back: Allow adequate room for service access, at least 61 cm (24 inches). Front: 86 cm (34 inches) for operator access. Height: For ease of use and optimum safety, the top of the library should be mounted approximately 120 cm (48 inches) above the floor.

Installing a Stand-Alone Library in a Rack

NOTE

For stand-alone installations, see “Connecting and Powering on the Library” on page 1-24.

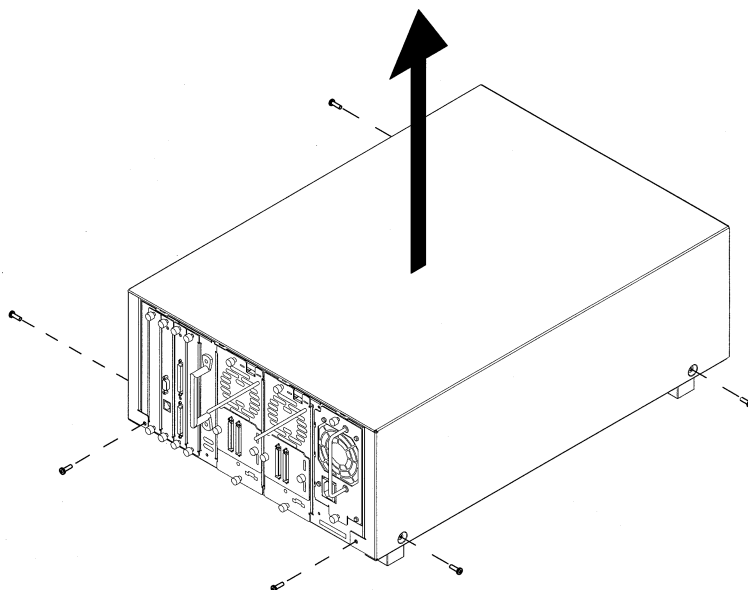
To install a stand-alone library in a rack, remove the cover and feet by following these steps:

1. Remove the following six screws (Figure 1-1):
 - a. Four screws, one located at each of the four feet
 - b. Two screws near the bottom of the library and in the back
2. Lift the cover off the library.

NOTE

The cover may fit tightly. If you cannot remove it easily, ease the sides out while lifting up on the cover.

Figure 1-1 **Removing the Cover**

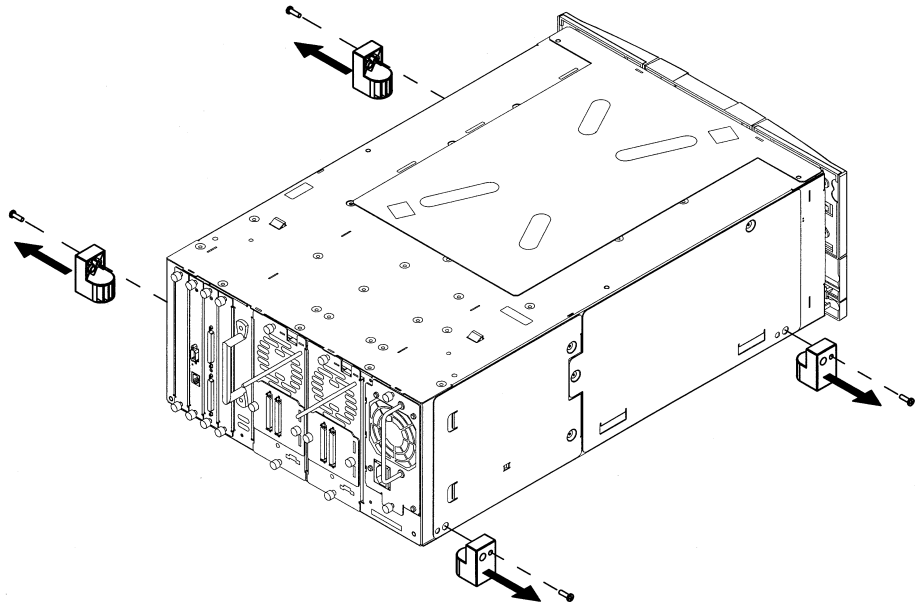


Installing a Stand-Alone Library in a Rack

3. Remove the feet as follows:
 - a. Remove the 10-24 torx T20 machine screws from the side of each foot assembly.
 - b. Slide the feet off the library.

Figure 1-2

Removing the Feet



4. Follow the rackmounting procedures in “Installing the Library into a Rack” on page 1-9.

Installing the Library into a Rack

The instructions in this section apply to library 20-slot, 40-slot, and 60-slot models mounted in a standard 19-inch rack with a depth between 24 and 34 inches.

CAUTION

Make sure that the rack and all equipment mounted in the rack have a reliable ground connection.

Verify that the total current of the rack components does not exceed the current rating of the power distribution unit or outlet receptacles.

WARNING

Do not move the library without additional help and/or an appropriately rated lift device. The 20-slot weighs 40.9 kilograms (90 pounds). The 40-slot weighs 76.4 kilograms (165 pounds). The 60-slot weighs 104.1 kilograms (229 pounds).

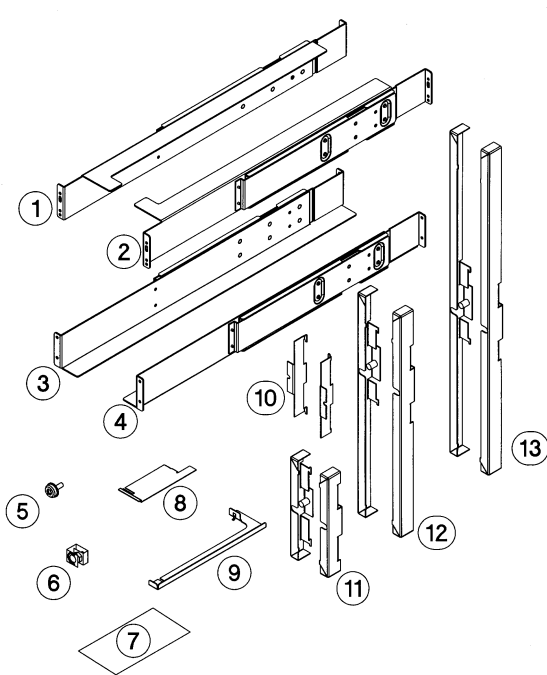
Tools and Parts

Before you begin, ensure that you have the following:

- Phillips #2 screwdriver
- Torx screwdriver with T20 bit
- 1/2-inch open-end wrench

Library Installation
Installing the Library into a Rack

Table 1-3 Rack Kit Parts

ID No.	Part and Quantity	
1	Upper left rail (1)	
2	Upper right rail (1)	
3	Lower left rail (1)	
4	Lower right rail (1)	
5	10-32 Screws (20)	
6	10-32 Clip nuts (20)	
7	Clip nut template (3 packaged together, one per model)	
8	20-Slot stop bracket (1)	
9	40-Slot and 60-Slot stop bracket (1)	
10	Flush-mount trim brackets (2)	
11	20-Slot trim brackets (2)	
12	40-Slot trim brackets (2)	
13	60-Slot trim brackets (2)	

NOTE

The rack kit may contain spare parts, intended for use with other racks. If you are installing the library into a flush-mount rack, use the trim brackets shown in 10. If you are installing the library into a 55-mm bezel-depth rack, use the trim brackets shown in 11, 12, or 13.

Rackmounting the Library (*for HP Authorized Personnel*)

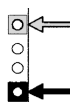
WARNING

Before you begin, lower the rack's leveler feet, and extend the rack's anti-tip foot. Failure to extend the anti-tip foot could result in personal injury or damage to the tape library if the rack tips over.

TIP

To use the display panel and access the tape doors, mount the top of the library in the middle of the rack or 120 cm (48 in) above the floor.

1. Use the template for your model library as a guide, and install five clip nuts into each front column of the rack (Figure 1-3, Figure 1-4, or Figure 1-5, depending on your library model). In Figure 1-4 and Figure 1-5, the grey clip nuts indicate the position of the trim brackets (see step 7). The upper grey clip nuts are used for racks with a 55 mm bezel depth. The lower grey clip nuts are used for flush-mount racks.



Use the template as a guide, and install four clip nuts into each back column of the rack.

Library Installation
Installing the Library into a Rack

NOTE

Use the EIA markers as a reference point to ensure that the holes on the rack correspond to the holes on the template. The EIA markers on the template are represented by #>.

Your rack might look different from the illustration. If the holes in the rack do not align with the template, move the template up one or two holes to create proper alignment.

Figure 1-3 **Clip Nuts (20-Slot Library)**

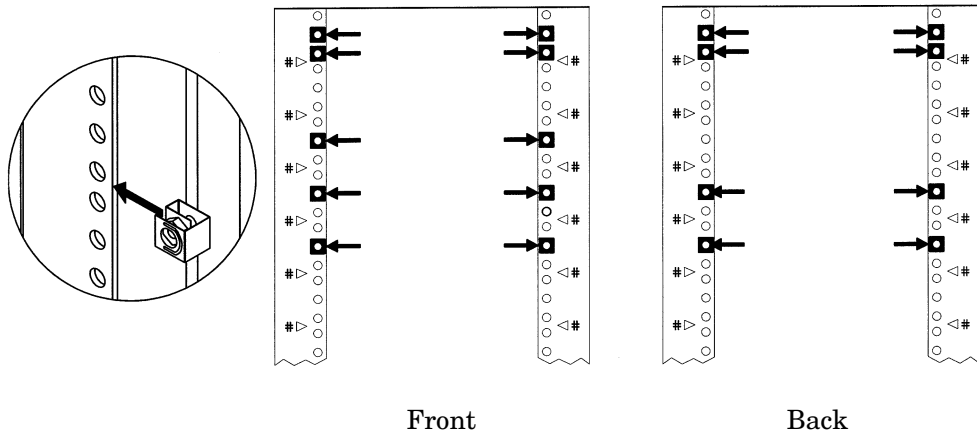


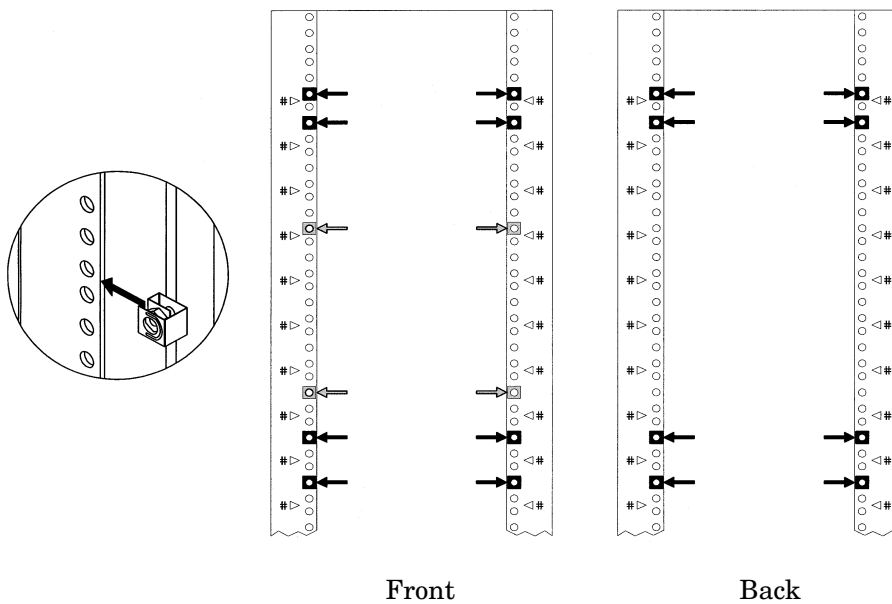
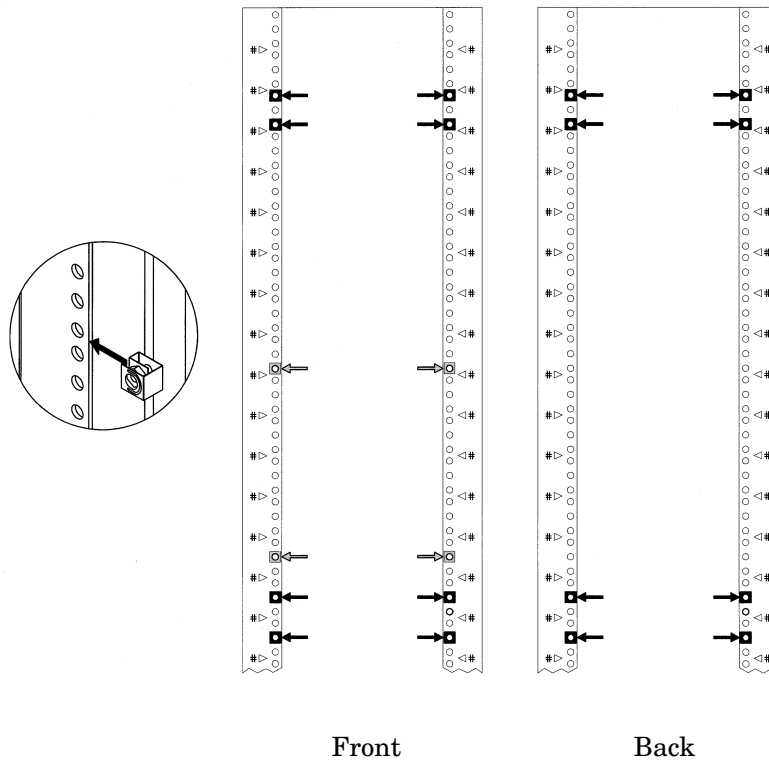
Figure 1-4 **Clip Nuts (40-Slot Library)**

Figure 1-5 Clip Nuts (60-Slot Library)



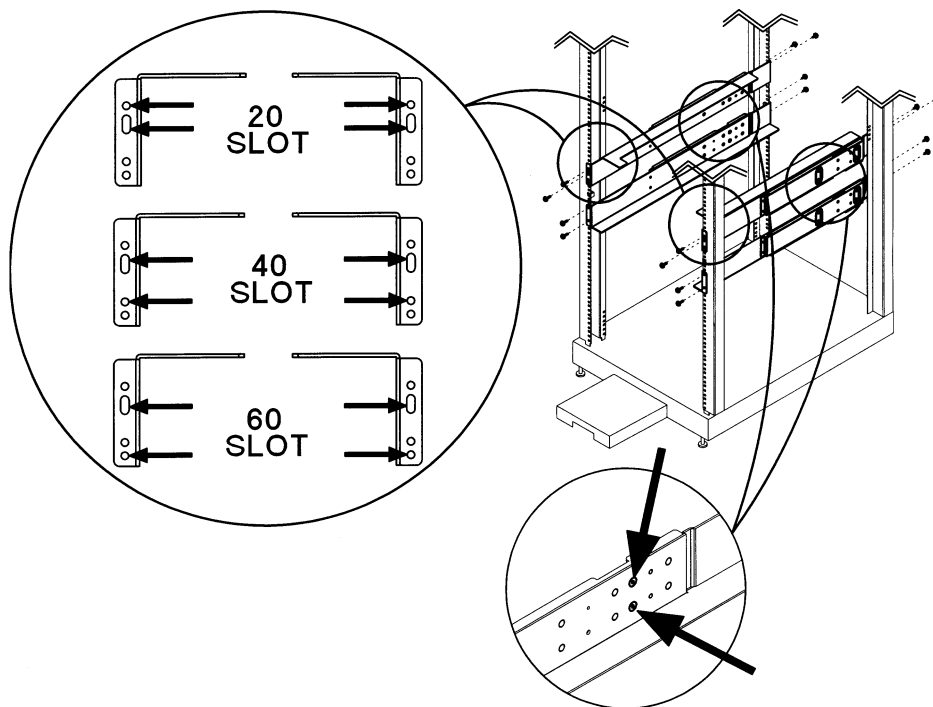
2. Align the upper (black) rail with the top two clip nuts and loosely install a screw into each clip nut. Slide the rail out so that it equals the rack depth, and attach to the back clip nuts. *To allow for enough clearance, do not tighten these screws until you have installed the library.*

NOTE

Ensure that you are using the appropriate holes in the upper rail to allow enough clearance, illustrated in Figure 1-6. *The clearance between the top and bottom rails should be: 20-slot library = 21.6 cm (8.5 in); 40-slot library = 43.2 cm (17 in); 60-slot library = 64.8 cm (25.5 in).*

3. Align the lower (black/silver) rail with the lower two clip nuts, and loosely install a screw into each clip nut. (See Figure 1-6, “Upper and Lower Rails.”)
 - a. Slide the rail so that it equals the rack depth, and loosely install the screws.
 - b. Tighten all screws to secure the rails.
 - c. Tighten the two pre-installed screws inside each mounting rail to secure the rail in position.

Figure 1-6 **Upper and Lower Rails**



Library Installation
Installing the Library into a Rack

4. Install the library.

CAUTION

The majority of the weight is near the back of the library. Use appropriate force when lifting the library.

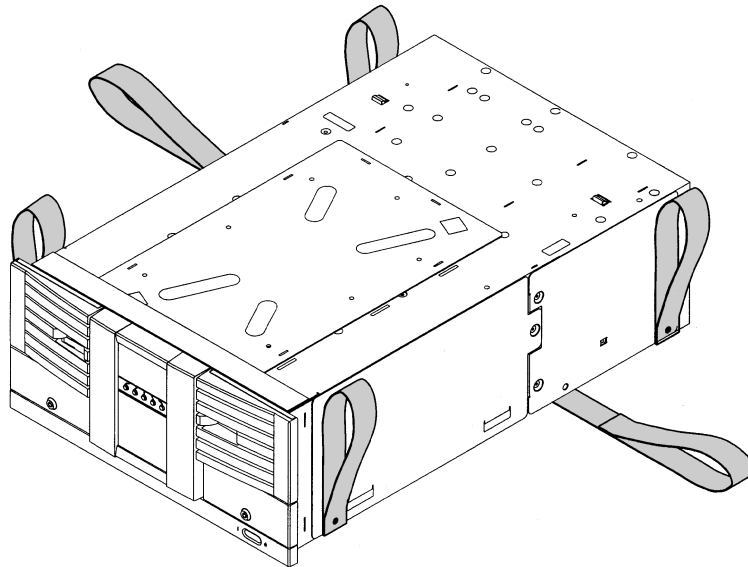
TIP

To reduce the weight of the library, you can remove all the drives. See “Removing and Replacing Drive Modules (for HP Authorized Personnel)” on page 4-54 for more information.

- **20-Slot Library:**

With the help of another person, use the lifting straps built into the sides of the library, and slide the library between the upper and lower sets of mounting rails. Remove the lifting straps once the library is partially installed. Save these straps for future use.

Figure 1-7 Lifting Straps

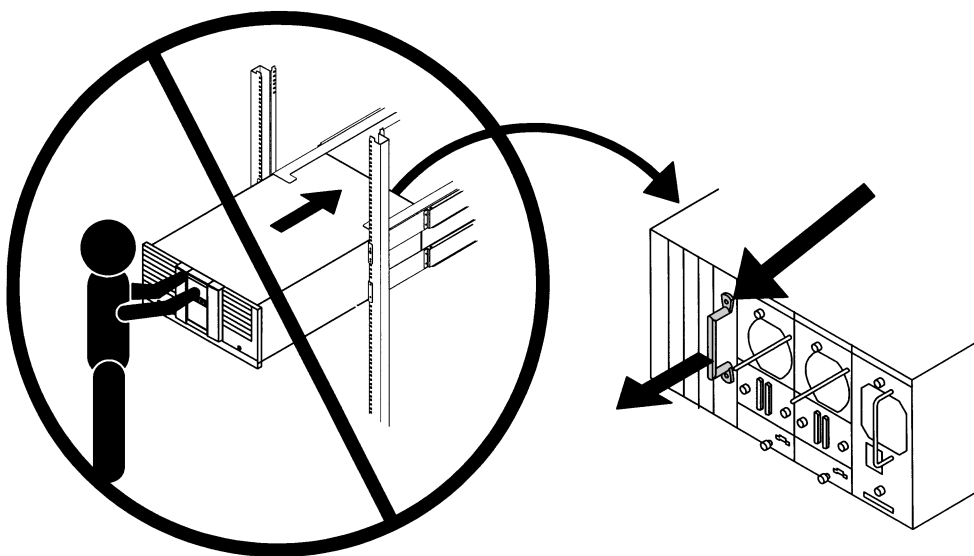


- **40-Slot Library and 60-Slot Library:**

Use a mechanical lift that is rated to the weight of the library, and follow the steps below to install the library.

- a. Break away the edges of the packing material at the bottom of the library.
- b. Use the straps to ease the library onto an appropriately rated mechanical lift. Use the lift to raise the library so that it aligns with the bottom rails.
- c. Slide the library onto the lower rails. Have at least one person guide the library from the front and one person pull the library from the back, using the vertical handle (Figure 1-8).
- d. Remove the lifting straps once the library is partially installed. Save the straps for future use.

Figure 1-8 **Library Installation**



CAUTION

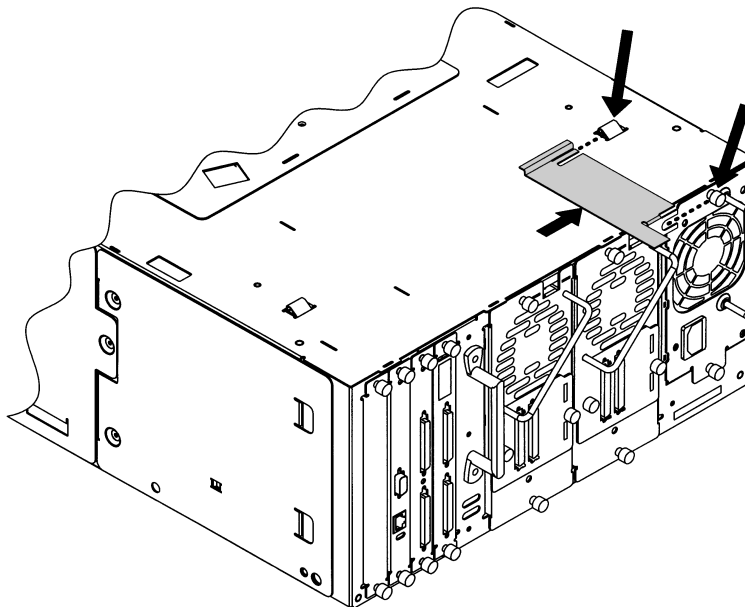
Do not push the library from the front. Use the handle shown in Figure 1-8. **DO NOT** pull on the handle(s) located on the back of the power supply or drive modules.

WARNING

Do not move the library without additional help and/or an appropriately rated lift device. The 20-slot weighs 40.9 kilograms (90 pounds). The 40-slot weighs 76.4 kilograms (165 pounds). The 60-slot weighs 104.1 kilograms (229 pounds).

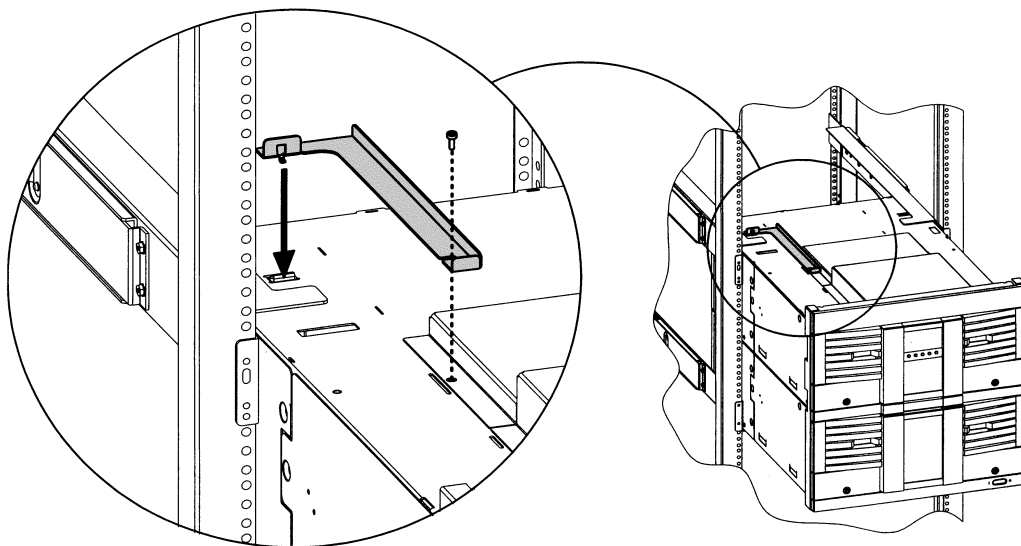
5. Tighten the screws on the top mounting rail to secure the library.
6. Install the stop bracket to ensure the library is secured inside the rack, and will not come out past the service position (approximately 2/3 of the library is out of the rack).
 - **20-Slot Library**
 - a. From the back of the library, unscrew the power supply thumbscrew by hand or with a screwdriver.
 - b. Install the stop bracket by sliding the edge of the bracket under the thumbscrew and threading the tab through the latch stop.
 - c. Tighten the power supply thumbscrew to secure the bracket to the library.

Figure 1-9 **Installing the Stop Bracket for the 20-Slot Library**



- **40-Slot Library and 60-Slot Library**
 - a. Ensure access to the top of the library. If necessary, push the library to the service position to access the top cover. *Do not push the library past the latch stop tabs.*
 - b. Remove the left back screw from the top cover.
 - c. Install the stop bracket by inserting the tab into the latch stop.
 - d. Re-install the screw into the top cover.

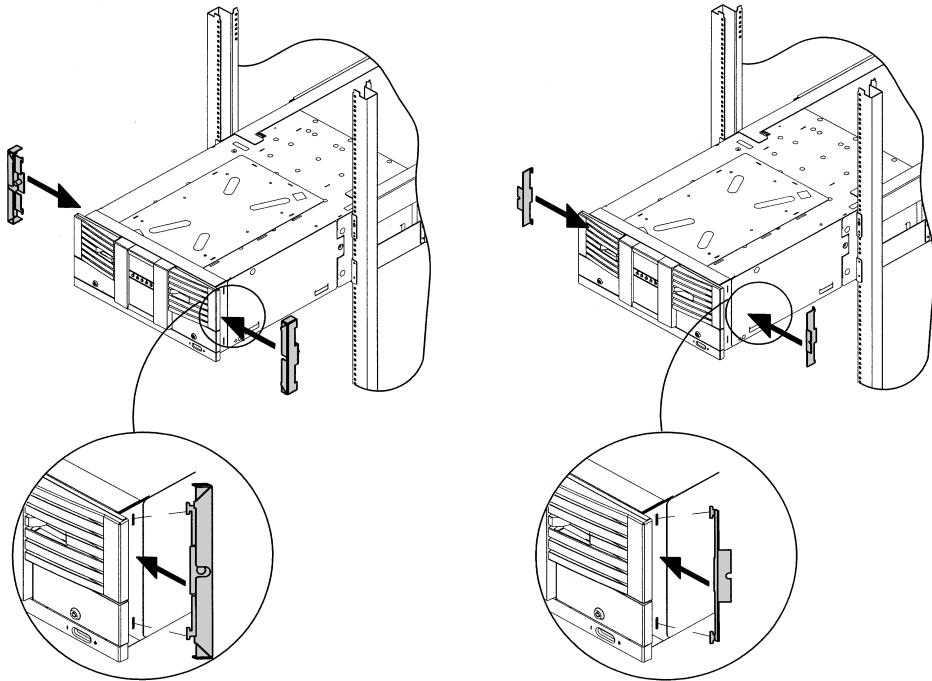
Figure 1-10 **Installing the Stop Bracket for 40-Slot and 60-Slot Libraries**



Library Installation
Installing the Library into a Rack

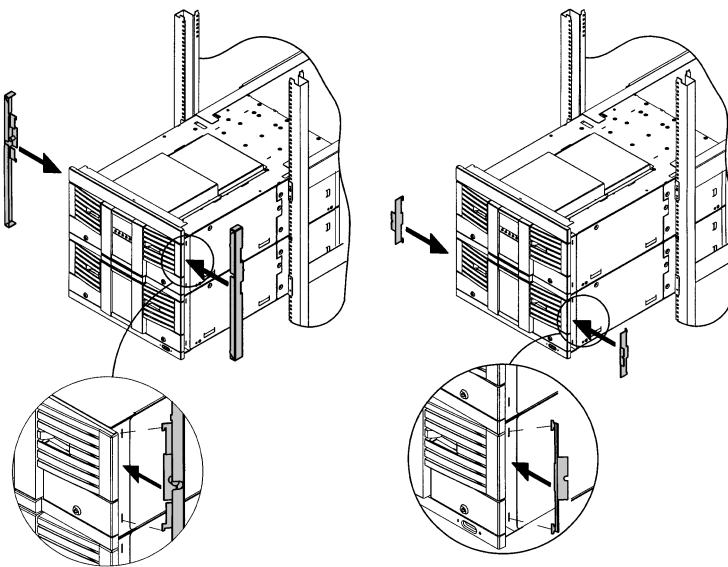
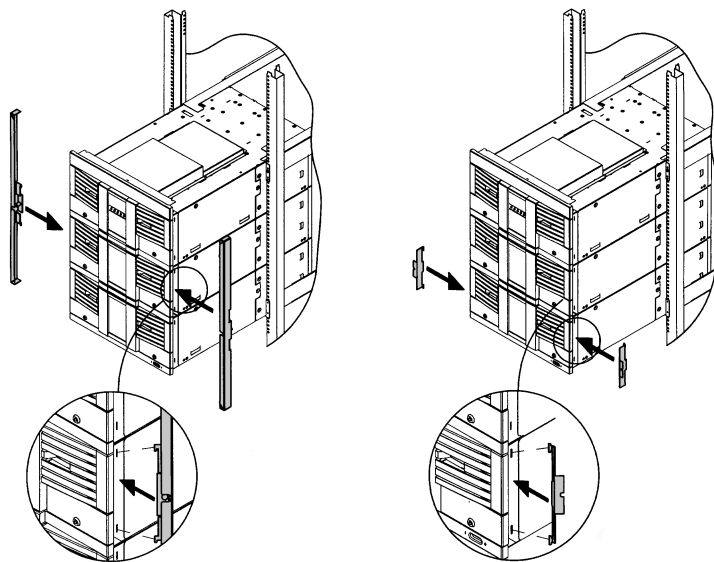
7. Insert trim brackets into the slots on each side of the library (Figure 1-11, Figure 1-12, Figure 1-13).

Figure 1-11 **Trim Brackets (20-Slot)**



NOTE

The illustration on the left shows the trim brackets for a rack bezel depth of 55-mm. The illustration on the right shows the trim bracket for a flush-mount rack.

Figure 1-12 Trim Brackets (40-Slot)**Figure 1-13** Trim Brackets (60-Slot)

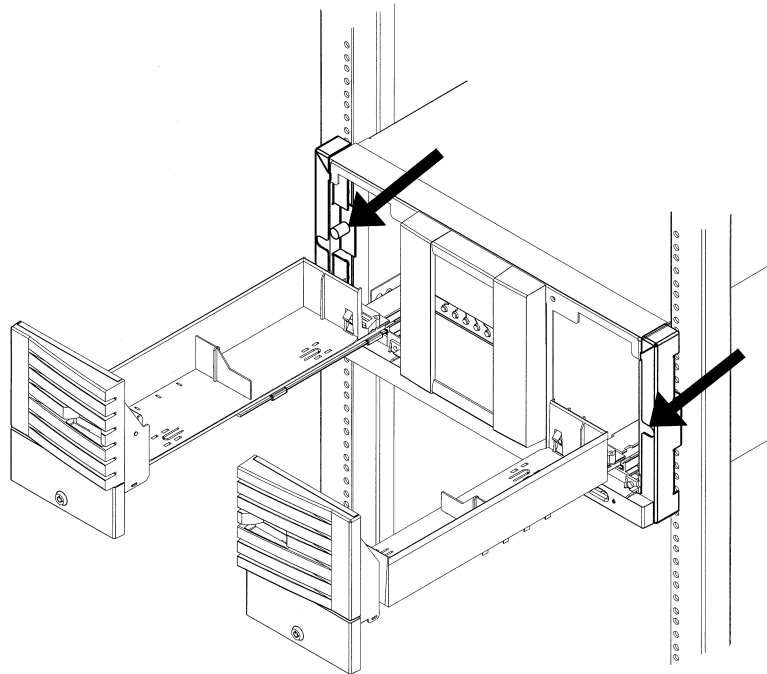
Installing the Library into a Rack

8. Open the tape doors and tighten the screws to secure the library into place (Figure 1-14).

NOTE

The doors may be key locked. The keys are attached to the power supply handle on the back of the library.

Figure 1-14 **Location of Securing Screws**



Preparing the Host for Installation

NOTE

Ensure that you have a host bus adapter card that is compatible with the library.

Install the SCSI host bus adapter card(s) and compatible driver(s). Refer to the host computer user manual and host bus adapter card instructions, and follow these general steps:

1. When the host is powered on, install software and/or driver(s) into the host that are compatible with the library.
2. If the host computer is connected to a network, check with the system administrator before turning off power.
3. Properly power off all peripheral devices connected to the host computer.
4. Power of the host.
 - Use proper procedures to prevent electrostatic discharge (ESD). Use wrist-grounding straps and anti-static mats when removing internal components.
 - Make sure that the host computer has an appropriate number of card expansion slots available for your library model.
 - Ensure the host bus adapter card is supported by your backup software application.
 - For optimum performance, there should be a maximum of one tape drive per bus. HP supports up to two drives per SCSI host bus adapter but recommends only one drive per bus. If compression is used when attaching two drives per bus, keep in mind the combined transfer rate of the drives must not exceed the throughput of the host bus adapter used.
 - Refer to Appendix A and the ANSI SCSI cable specification for more information on SCSI cable length requirements.
 - Check for available SCSI IDs if you are installing the library onto the same SCSI bus as other devices. You might need to change the SCSI ID from the library front panel if you think there will be an ID conflict with other devices.

Connecting and Powering on the Library

This section includes information and illustrations for the following:

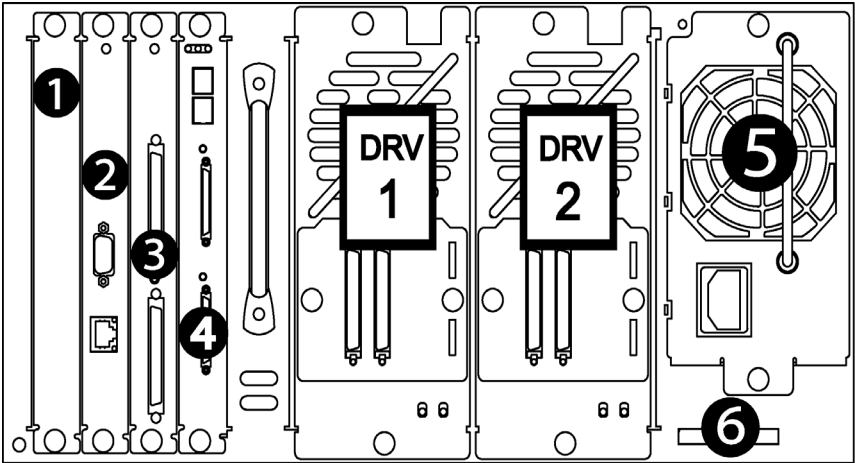
- Library back panel
- SCSI cabling connections
- Fibre Channel cabling connections

NOTE

The figures in this section depict a fully loaded library. The number of drives and cards will vary depending on your model.

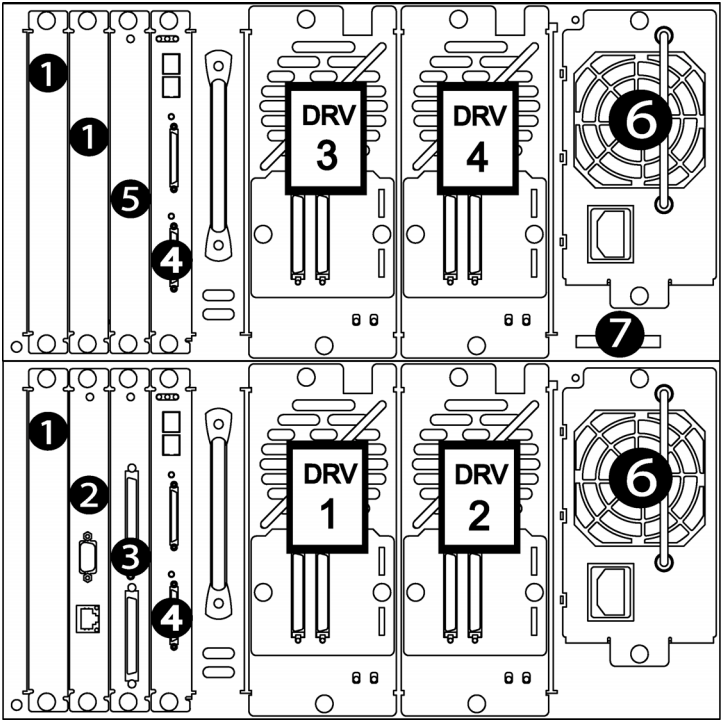
Library Back Panel

Figure 1-15 20-Slot Back Panel Features



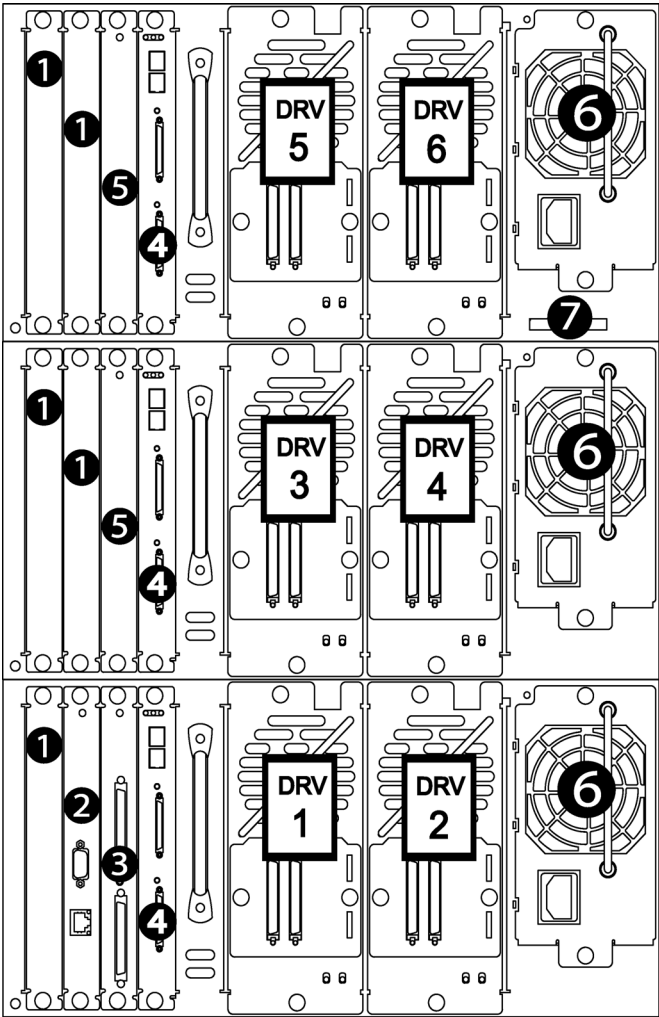
1	Vacant slot	4	Fibre Channel interface
2	Remote management card	5	Power supply
3	Library controller card	6	Product information labels

Figure 1-16 40-Slot Back Panel Features



1	Vacant slot	5	Slave controller card
2	Remote management card	6	Power supply
3	Library controller card	7	Product information labels
4	Fibre Channel interface		

Figure 1-17 **60-Slot Back Panel Features**



1	Vacant slot	5	Slave controller card
2	Remote management card	6	Power supply
3	Library controller card	7	Product information labels
4	Fibre Channel interface		

SCSI Cable Connections

NOTE

Refer to “Fibre Channel Cable Connections” on page 1-33 if the library is configured with Fibre Channel.

This section illustrates a standard SCSI configuration that produces a high level of data storage performance (one SCSI host bus adapter card for each drive in the library with the library controller daisy-chained to the first drive). HP supports up to two drives per SCSI host bus adapter but recommends only one drive per bus. If compression is used when attaching two drives per bus, keep in mind the combined transfer rate of the drives must not exceed the throughput of the host bus adapter used.

Connect the library as follows (refer to Figure 1-18 through Figure 1-20):

1. Properly power off all peripheral devices connected to the host computer.
2. Power off the host. If the host is connected to a network, check with the system administrator before turning off power.
3. Connect a 68-pin jumper cable from the top connector of the library controller to the left drive module (drive module 1).

CAUTION

Use SCSI cables and HVDS differential terminators for high-voltage SCSI interfaces. Use SCSI cables and LVDS differential terminators for low-voltage SCSI interfaces. The label on the library controller indicates high or low voltage.

4. Connect the appropriate 68-pin SCSI terminator to the bottom connector on the library's controller card.
5. Connect a 68-pin SCSI cable from a host SCSI card to each drive module. Add the appropriate terminators to the remaining SCSI connectors.
6. Connect the remote management card (see “Using the Remote Management Card” on page 3-9).

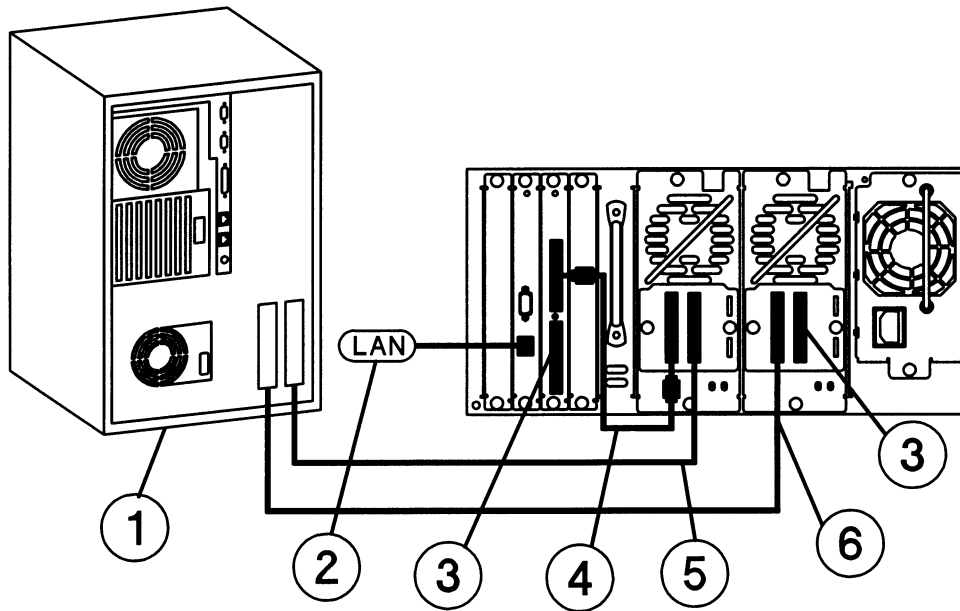
NOTE

The AC power cord is the library's main AC disconnect device and must be easily accessible at all times.

7. Connect a power cord to each power supply module on all levels.
8. Power on the library by pressing the recessed power (standby) switch, located on the front of the library in the bottom right corner.

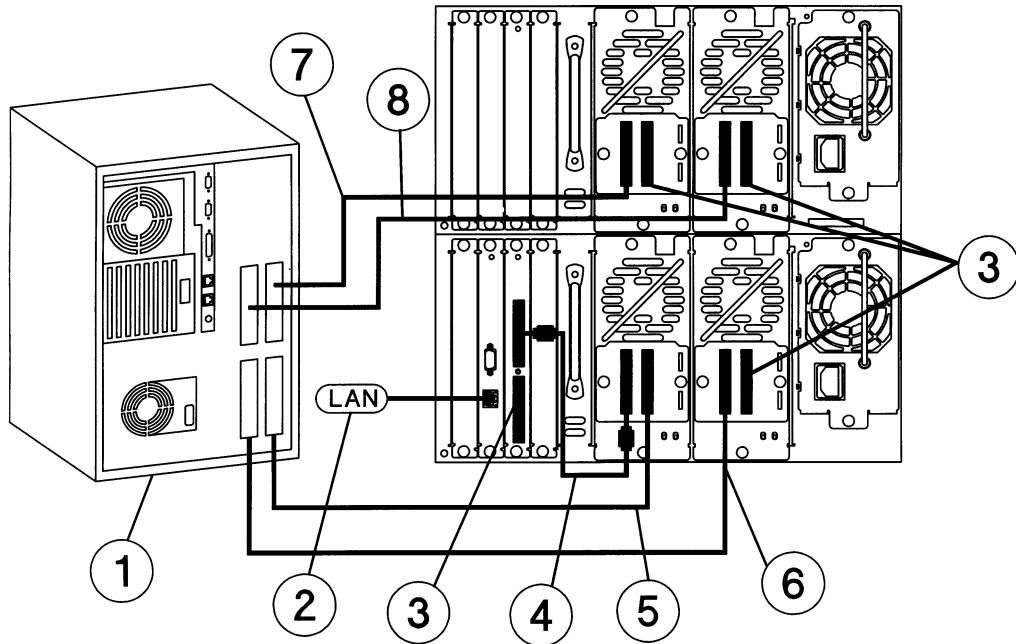
After the power-up test is complete (after several minutes), you will see the Home Screen on the library's front panel. The Home Screen displays the status of the drives and library. See “Front Panel Status Information (Home Screen)” on page 2-7.

9. Power on other peripherals, and then the host.

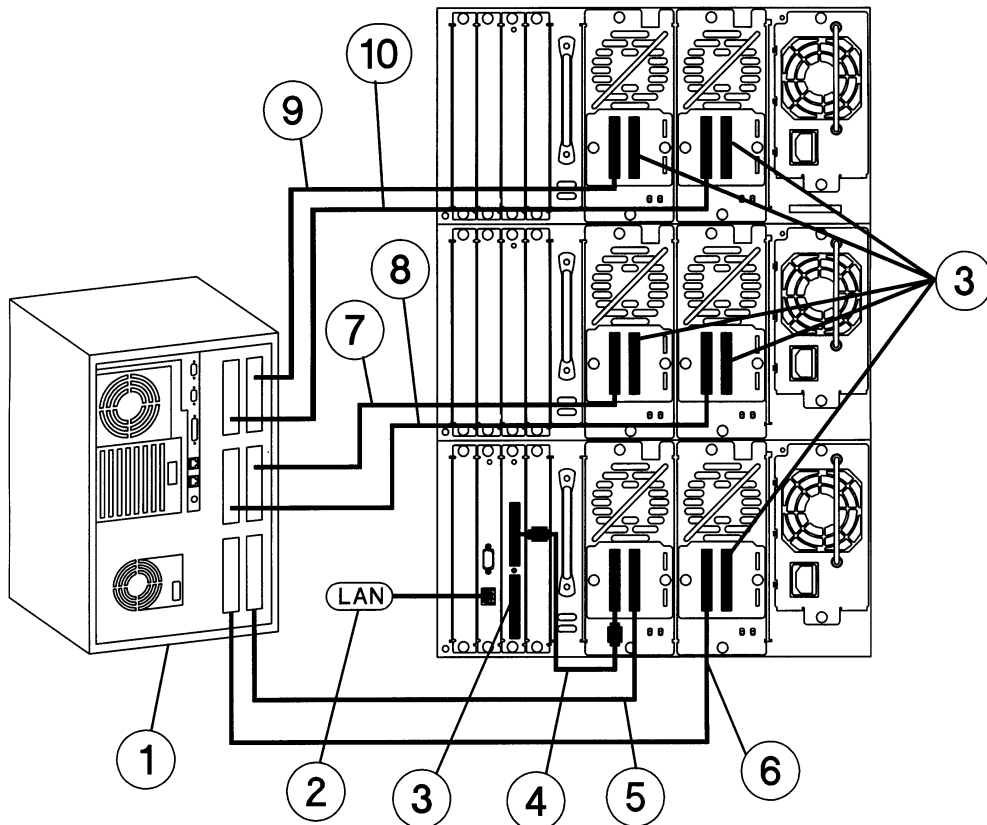
Figure 1-18 **20-Slot SCSI Cable Connections**

1	Host (user configured)
2	Remote management card LAN connection
3	Appropriate 68-pin SCSI terminator
4	Jumper cable with SCSI 68-pin connectors
5	SCSI cable from drive 1 to host
6	SCSI cable from drive 2 to host

Figure 1-19 40-Slot SCSI Cable Connections



1	Host (user configured)
2	Remote management card LAN connection
3	Appropriate 68-pin SCSI terminator
4	Jumper cable with SCSI 68-pin connectors
5	SCSI cable from drive 1 to host
6	SCSI cable from drive 2 to host
7	SCSI cable from drive 3 to host
8	SCSI cable from drive 4 to host

Figure 1-20 60-Slot SCSI Cable Connections

1	Host (user configured)	6	SCSI cable from drive 2 to host
2	Remote management card LAN connection	7	SCSI cable from drive 3 to host
3	Appropriate 68-pin SCSI terminator	8	SCSI cable from drive 4 to host
4	Jumper cable with SCSI 68-pin connectors	9	SCSI cable from drive 5 to host
5	SCSI cable from drive 1 to host	10	SCSI cable from drive 6 to host

SCSI Cabling Considerations

Some SCSI cabling variations, such as daisy-chaining drives, will degrade library performance. For more information, visit the HP Customer Care website at www.hp.com/go/support.

TIP

Dual port cards are available and will reduce slot usage in the host system.

Fibre Channel Cable Connections

NOTE

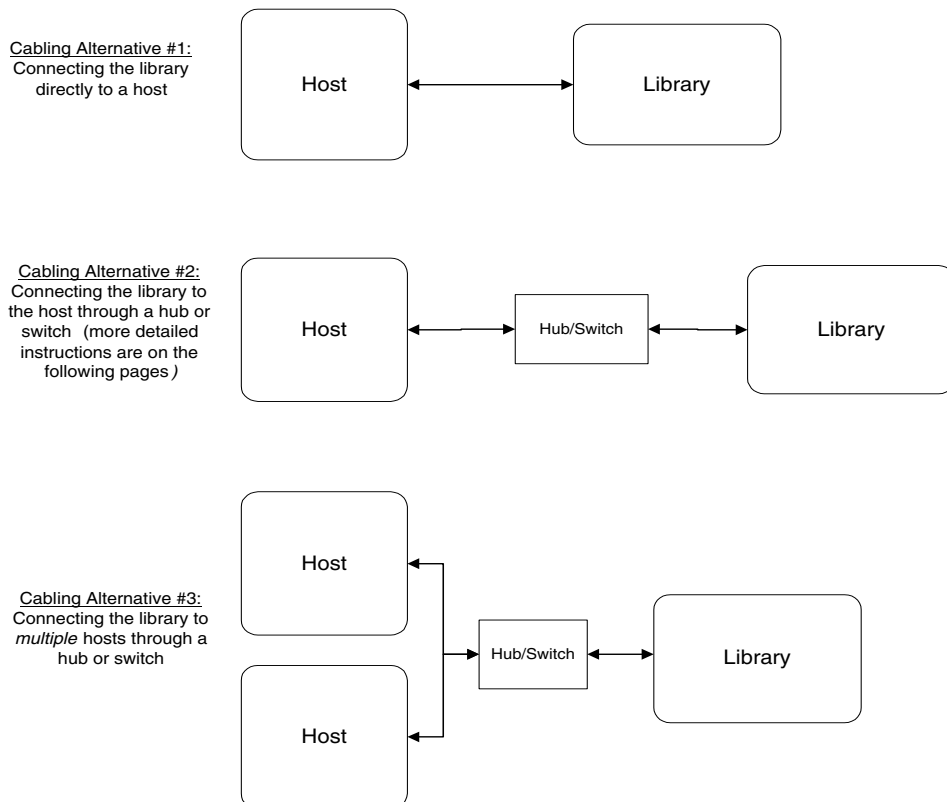
If you are not familiar with Fibre Channel technology, refer to Appendix C for an overview.

There are several Fibre Channel cabling options. Figure 1-21 provides an overview.

NOTE

When using hubs or switches, consult the user documentation for those products. For detailed information on HP supported topologies, refer to the *SAN Solution Installation Guide* available from www.hp.com/go/support.

Figure 1-21 **Fibre Channel Cabling Alternatives**



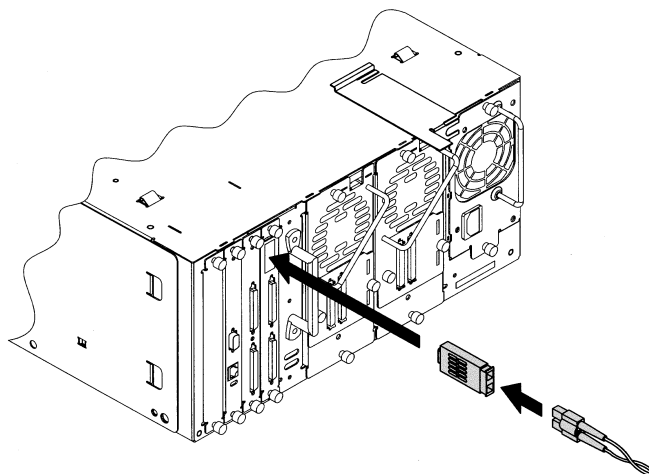
Connecting and Powering on the Library

The following steps illustrate a Fibre Channel connection between the host, hub or switch, and library. Refer to Figure 1-23, Figure 1-24, or Figure 1-25, and connect the library as follows:

1. Ensure that the library and host are inactive, and the library is disconnected from the host.
2. Ensure that the required host software has been installed.
3. Power off the host, hub, or switch. If the host is connected to a network, check with the system administrator before turning off power.
4. Install a host bus adapter into the host computer. Use proper procedures to prevent electrostatic discharge (ESD). Use wrist-grounding straps and anti-static mats when removing internal components.
5. Connect the hardware.
 - a. On each level of the library, connect the supplied SCSI jumper cable from bus 1 on each Fibre Channel interface to the left connector on the left drive module.
 - b. On each level of the library, connect the supplied SCSI jumper cable from bus 2 on each Fibre Channel interface to the left connector on the right drive module.
 - c. Connect the supplied SCSI jumper cable from the top connector on the library controller card to the right connector on the left drive module (drive module 1) to daisy chain the library controller to the drive.
 - d. Terminate the bottom connector on the library controller card.
 - e. Connect the appropriate SCSI terminator to the remaining connectors on the drive modules. Ensure that the interface type matches your library.

- f. Connect the Fibre Channel cable(s) to the host, hub, or switch.
 - For the standard performance Fibre Channel interface, a GBIC is required. (See Figure 1-22.)

Figure 1-22 **Fibre Channel Connections (Standard Performance Interface)**



NOTE

Your Fibre Channel interface type (standard or high performance) is dependent on the drive technology in your library. To identify whether you have the high performance or standard performance Fibre Channel interface, see page 4-23 and page 4-24.

CAUTION

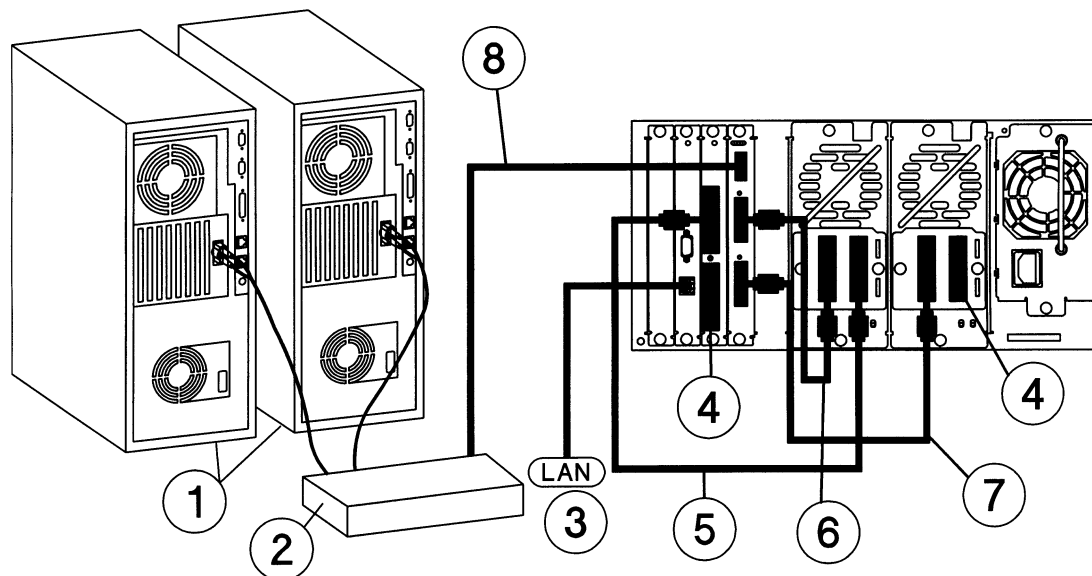
The Fibre Channel printed circuit boards may contain a laser system (GBIC or GLM module) that is classified as a “Class-I Laser Product” under a U.S. Department of Health and Human Services (DHHS) Radiation Performance standard according to the Radiation Control for Health and Safety Act of 1968 and EN60825-1(+A11) safety of laser products. The compliance statement is located on the module.

6. Power on the hub or switch (if present).

NOTE

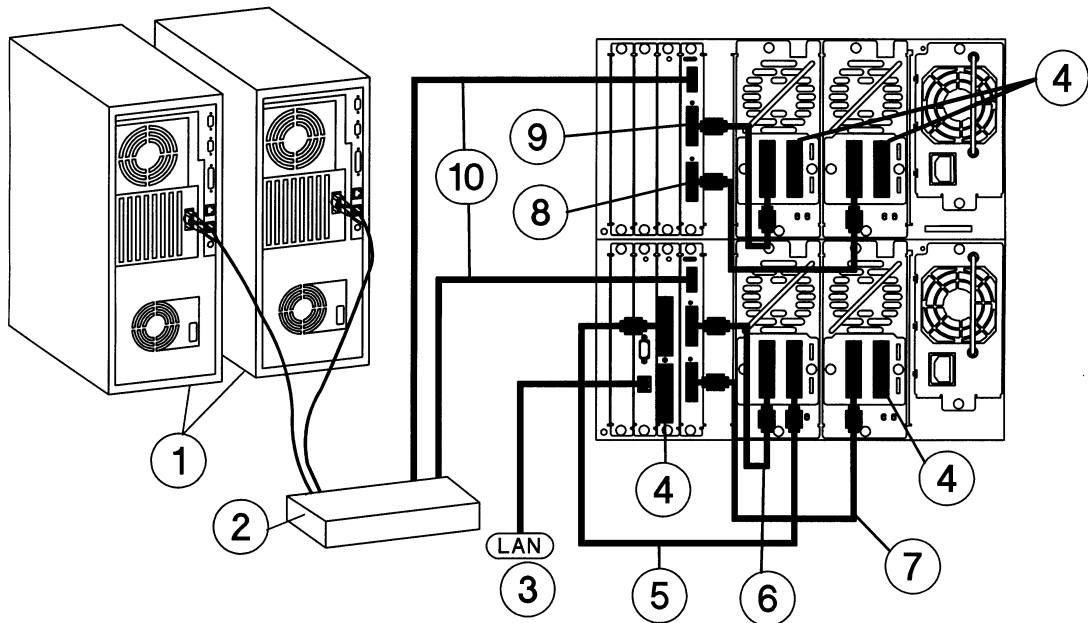
The AC power cord is the library's main AC disconnect device and must be easily accessible at all times.

7. Connect the power cord(s) from the library to a grounded power receptacle. Power on the library by pressing the recessed power (standby) switch located on the front of the library in the bottom right corner. After the power-up test is complete (after several minutes), you will see the Home Screen on the library's front panel. The Home Screen displays the status of the drives and library.
8. From the front panel, configure the library for Fibre Channel. See "Configuring the Library for Fibre Channel" on page 3-15 for more information.
9. Connect the remote management card (see "Using the Remote Management Card" on page 3-9).
10. Power on the host.

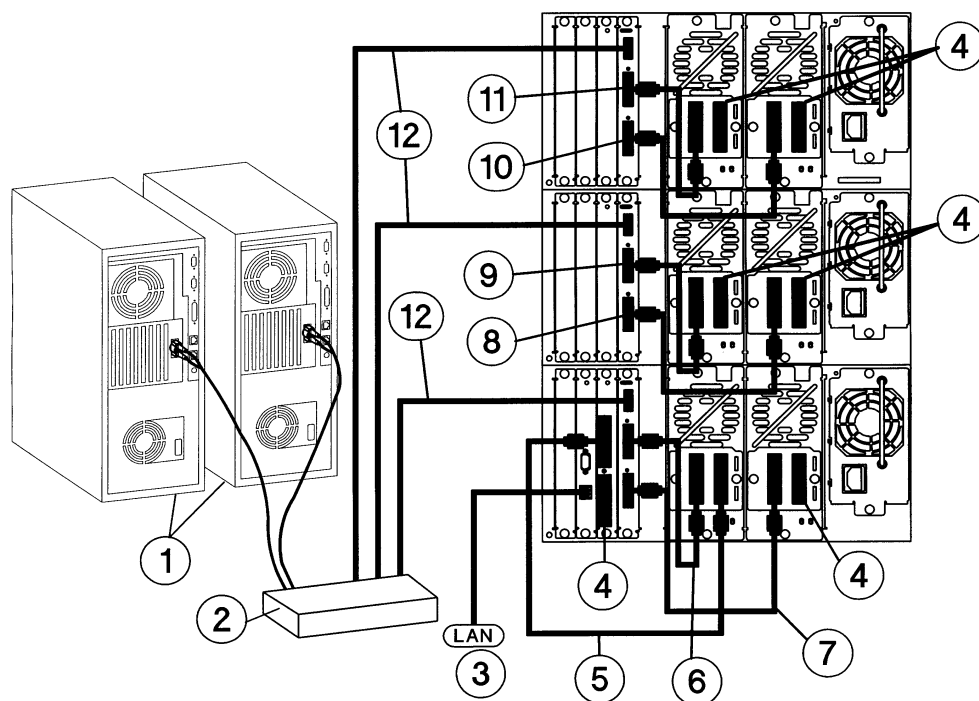
Figure 1-23 20-Slot Fibre Channel Connections

1	Hosts (user configured)	5	SCSI cable from the library controller card to drive 1
2	Hub or switch	6	SCSI cable from bus 1 on the Fibre Channel interface to drive 1
3	Remote management card LAN connection	7	SCSI cable from bus 2 on the Fibre Channel interface to drive 2
4	Appropriate SCSI terminator	8	Fibre Channel cable to hub or switch

Figure 1-24 40-Slot Fibre Channel Connections



1	Hosts (user configured)	6	SCSI cable from bus 1 on the Fibre Channel interface to drive 1
2	Hub or switch	7	SCSI cable from bus 2 on the Fibre Channel interface to drive 2
3	Remote management card LAN connection	8	SCSI cable from bus 2 on the Fibre Channel interface to drive 4
4	Appropriate SCSI terminator	9	SCSI cable from bus 1 on the Fibre Channel interface to drive 3
5	SCSI cable from the library controller card to drive 1	10	Fibre Channel cable to hub or switch

Figure 1-25 60-Slot Fibre Channel Connections

1	Hosts (user configured)	7	SCSI cable from bus 2 on the Fibre Channel interface to drive 2
2	Hub or switch	8	SCSI cable from bus 2 on the Fibre Channel interface to drive 4
3	Remote management card LAN connection	9	SCSI cable from bus 1 on the Fibre Channel interface to drive 3
4	Appropriate SCSI terminator	10	SCSI cable from bus 2 on the Fibre Channel interface to drive 6
5	SCSI cable from the library controller card to drive 1	11	SCSI cable from bus 1 on the Fibre Channel interface to drive 5
6	SCSI cable from bus 1 on the Fibre Channel interface to drive 1	12	Fibre Channel cable to hub or switch

Configuring the Host System

Once the library is connected to a host, the Windows NT™, Sun Solaris™, HP-UX™, and MPE/iX™ operating systems must be configured to recognize it. The procedures are different, depending on the host system.

Windows NT

For Windows NT operating systems, perform the following operating system configurations:

- Install the appropriate host bus adapter(s)
- Install the corresponding drivers for the interface card(s)
- Install the backup software

To verify the installation, look for the library and drive after powering up the host.

- Go into **Settings --> Control Panel --> SCSI Adapter**
- You can also check your installation on Windows NT with HP diagnostic utilities available from www.hp.com/go/support. See the **Downloads and Drivers** section for your library model.

Run a test backup to ensure that all components are properly configured.

Sun Solaris

For Sun Solaris operating systems, perform the following operating system configurations:

- Install the appropriate host bus adapter(s)
- Install the corresponding drivers for the interface card(s)
- Install the backup software

To verify the installation, look for the library and drive after powering up the host.

1. Close all open applications and exit the Common Desktop Environment (CDE).

- 2. Type “init 0” at any prompt. This will shut down all processes, and take you to the OpenBoot PROM.
- 3. Type “reset”.
- 4. At the OK prompt, type “probe-scsi-all”.

Run a test backup to ensure that all components are properly configured.

HP-UX Hosts

To enable communication between the host and tape library, appropriate drivers must be configured into the HP-UX kernel. Table 1-4 shows which drivers are necessary for each device.

NOTE

Some drivers have different names, depending on whether or not they are listed in the output of an ioscan or in the system file.

Table 1-4 Drivers Needed

Device	Driver Name	
	In ioscan	In system file
SCSI Host Bus Adapter (HSC or PCI Bus)	c720	c720
Fibre Channel Host Bus Adapter	fcp	fcT1_fcp
	fcT1	fcT1
	fcT1_cntl	fcT1_cntl
Fibre Channel Bridge or Multiplexer	fcpmux	fcpmux
Tape Library Robotics Controller (HSC or PCI Bus)	sctl	sctl
Tape Driver (HSC or PCI Bus)	stape	stape

Library Installation

Configuring the Host System

If these drivers are already installed into the kernel, upon system boot they will automatically be associated with the hardware that they control. However, if drivers are missing, they must be installed. For more information on installing Fibre Channel drivers, refer to the *HP Fibre Channel Mass Storage Adapter Service and User Manual (A3636-90002)*.

A pass-through driver is used to manage the robotics controller. Since this driver is not dedicated for this particular device, it must be manually installed. The following sections describe this process:

- Installing the pass-through driver (below)
- Creating a device file for the robotics controller (page 1-43)
- Verifying the installation (page 1-45)

Installing the Pass-Through Driver

Obtain information about the peripherals attached to the system:

```
ioscan -f
```

The screen should look similar to the following:

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
bc	0		root	CLAIMED	BUS_NEXUS	
bc	1	8	bc	CLAIMED	BUS_NEXUS	Pseudo Bus Converter
ba	0	8/0	GSCToPCI	CLAIMED	BUS_NEXUS	PCI Bus Bridge - GSCToPCI
ext_bus	1	8/0/2/0	c720	CLAIMED	INTERFACE	Ultra Wide SCSI
target	3	8/0/2/0.0	tgt	CLAIMED	DEVICE	
autoch	2	8/0/2/0.0.0	schgr	CLAIMED	DEVICE	HP C7200-8000
target	4	8/0/2/0.1	tgt	CLAIMED	DEVICE	
tape	2	8/0/2/0.1.0	stape	CLAIMED	DEVICE	QUANTUM DLT8000
target	5	8/0/2/0.2	tgt	CLAIMED	DEVICE	
tape	4	8/0/2/0.2.0	stape	CLAIMED	DEVICE	QUANTUM DLT8000

NOTE

HP C7200-8000 is used only as an example. The actual ioscan output will reflect the product number of the library you are configuring.

HSC or PCI Pass-Through Driver Installation

The following procedure assumes the use of a SAM terminal mode. In X-windows (GUI) mode, use the mouse button to select an option.

1. Run SAM.
2. Select `Kernel Config`, and press Return.
3. Select `Drivers`, and press Return.
4. Select `sctl`.

NOTE

If Current State is “In,” proceed to “Creating a Device File for the Robotics Controller”. Otherwise, continue with the next step.

5. From the Menu Bar, select `Actions`. Select `Add Drivers to Kernel`, and press Return.
6. From the Menu Bar, select `Actions`. Select `Create New Kernel`, and press Return.
7. At the *Are you sure* prompt, respond *Yes*. Press Return.
8. After the status messages, select `OK`. Press Return. The system reboots.

Creating a Device File for the Robotics Controller

1. Use the `mknod` command to create a device file to access the robotics controller. The command syntax is:

```
/user/sbin/mknod /dev/scsi/<devfilename> c <majornum>
<minornum>
```

- <devfilename> is the user-defined name of the device file.
- <majornum> is the character major number from the `lsdev` command.
- <minornum> is the minor number in the format `0xII TL00`; where `II` is the two-digit card instance number in hexadecimal; `T` is the target SCSI ID number; `L` is the LUN number, and `00` is reserved.

Library Installation

Configuring the Host System

2. Determine the value for <majornum> by executing the following command for robotics attached to an HSC or PCI adapter:

```
lsdev -d sctl
```

The output resembles the following:

	Character	Block	Driver	Class
HSC or PCI	203	-1	sctl	ctl

Determine the value for <minornum> using the `ioscan` command. The applicable lines in the `ioscan` output are those that refer to the controller (contains the product name in the Description field) and to the adapter (contains the `ext_bus` in the Class field).

For the HSC or PCI adapter, the `ioscan` output for the `schgr` driver can differ in two ways, though either indicates successful device file creation.

- If the `schgr` driver is configured on the system, this driver appears to be associated with the library. The output would resemble the following:

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
autoch	0	10/4/4.6.0	schgr	CLAIMED	DEVICE	HP C7200-8000

If the `schgr` driver is not configured on the system, no driver appears to be associated with the library. The `ioscan` output line resembles:

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
unknown	-1	10/4/4.6.0		UNCLAIMED	DEVICE	HP C7200-8000

Verifying the Installation

Confirm that the communications path to the robotics controller is functional:

1. Compile the SCSI I/O test program:

```
cc /usr/contrib/src/scsi_io.c. -o/usr/contrib/bin/  
scsi_io
```
2. Run the SCSI I/O test program, using the device file created during installation. For example, if the device file name is `/dev/rmt/HPA1234`, the command would be:

```
/usr/contrib/bin/scsi_io /dev/scsi/HPA1234
```

If the robotics is correctly configured, the following appears:
the thing claims to be: HP C7200-8000

NOTE

HP C7200-8000 is used only as an example. The actual `ioscan` output will reflect the product number and firmware revision of the library you are configuring.

MPE/iX Hosts

Requirements

Libraries require additional Legato NetWorker Server software that runs on either an HP Intelligent Server or an NT Server. The HP 3000 must be a Legato Networker Storage Node.

Configuring the Host

The example below illustrates the steps needed to configure the library on MPE/iX.

NOTE

This example illustrates the driver binding, but is not optimized for performance since it shows the entire library on a single differential bus.

NOTE

The library ID of A4669A is used only as an example. The actual RUN MAPPER output reflects the product number of your library.

1. Power on the library and host. Run ODE at the ISL prompt:

```
ISL>ODE
```

2. Identify the device path through RUN MAPPER:

```
ODE> RUN MAPPER
***STARTING EXECUTION OF MAPPER***
Processor Identification:
...
I/O Configuration:
Type HW SW Revisions
Path Component Name ID Mod Mod Hdwr Firm
...
/4/4 HP-PB Fast Wide SCSI . . .
/4/4.0.0 A4669A . . .
/4/4.1.0 DLT8000 . . .
/4/4.2.0 DLT8000 . . .
/4/4.3.0 DLT8000 . . .
/4/4.4.0 DLT8000 . . .
```

3. Boot the system. At the MPE prompt, run `sysgen` and start the `io` section:

```
sysgen
SYSGEN version E . . .
sysgen> io
** IO configurator commands **
```

4. If not already configured, configure the differential card and the pseudo/target level of the SCSI path:

```
io> apath 10/4/4 id=HP28696A
io> apath 10/4/4.0 id=pseudo
io> apath 10/4/4.1 id=pseudo
io> apath 10/4/4.2 id=pseudo
io> apath 10/4/4.3 id=pseudo
io> apath 10/4/4.4 id=pseudo
```

5. Configure the robotics controller and the drives (the pass-thru driver):

```
io> adev 30 id=HPA4669A path=10/4/4.0.0
io> adev 31 id=DLT8000 path=10/4/4.1.0 mode=autoreply
io> adev 32 id=DLT8000 path=10/4/4.2.0 mode=autoreply
io> adev 33 id=DLT8000 path=10/4/4.3.0 mode=autoreply
io> adev 34 id=DLT8000 path=10/4/4.4.0 mode=autoreply
```

6. Verify the bindings between `PATH`, `LDEV` number, `ID`, `PMGR` (device drivers), and `LMGR` attributes for each device configured.

- a. Verify the binding for the device adapter (the fw/differential dam):

```
io> lpath 10/4/4.0.0
PATH: 10/4/4 LDEV:
ID: HP28696A TYPE: DA
PMGR: FWSCSI_DAM PMGRPRI: 6
LMGR: MAXIOS: 0
```

Repeat this step for `lpath 10/4/4.1`, `4.2`, `4.3`, and `4.4`.

- b. Verify the binding for the targets (the transparent dm):

```
io> lpath 10/4/4.0
PATH: 10/4/4.0 LDEV:
ID: PSEUDO TYPE: DA
PMGR: TRANSPARENT_MGR PMGRPRI: 6
LMGR: MAXIOS: 0
```

Repeat this step for `lpath 10/4/4.1`, `4.2`, `4.3`, and `4.4`.

- c. Verify the binding for the robotics controller (the pass-thru driver):

```
io> lpath 10/4/4.0.0
PATH: 10/4/4.0.0 LDEV: 30
ID: HPA4669A TYPE: MOSAR_AC
PMGR: MO_SCSI_PTHRU_DM PMGRPRI: 10
LMGR: LOGICAL_DEVICE_MANAGER MAXIOS: 0
```

Repeat this step for `lpath 10/4/4.1`, `4.2`, `4.3`, and `4.4`.

- d. Verify the binding for the tape drives (the differential tape dm):

```
io> lpath 10/4/4.1.0
PATH: 10/4/4.1.0 LDEV: 31
ID: DLT8000 TYPE: TAPE
PMGR: SCSI_TAPE2_DM PMGRPRI: 10
LMGR: LOGICAL_DEVICE_MANAGER MAXIOS:
```

Repeat this step for `lpath 10/4/4.1`, `4.2`, `4.3`, and `4.4`.

- e. To configure the Storage Node on the NetWorker server, verify the ldev specifications:

```
io> Idev 30/34
LDEV: 30 DEVNAME: OUTDEV: 0 MODE:
ID: HPA4669A RSIZE: 128 DEVTYPE: MOSAR_AC
PATH: 10/4/4.0.0 MPETYPE: 24 MPESUBTYPE: 4
CLASS:
LDEV: 31 DEVNAME: OUTDEV: 0 MODE:
ID: DLT8000 RSIZE: 128 DEVTYPE: TAPE
PATH: 10/4/4.1.0 MPETYPE: 24 MPESUBTYPE: 8
CLASS: TAPE
...
LDEV: 34 DEVNAME: OUTDEV: 0 MODE:
ID: DLT8000 RSIZE: 128 DEVTYPE: TAPE
PATH: 10/4/4.4.0 MPETYPE: 24 MPESUBTYPE: 8
CLASS: TAPE
```

- 7. Save the configuration changes as follows:

- a. Hold the configuration changes:

```
io> hold
```

- b. Exit the io section:

```
io> exit
```

- c. If you have followed the local convention for backing up the configuration file, keep the changes:

```
sysgen> keep
```

```
keeping to group CONFIG.SYS
```

```
Purge old configuration (yes/no)?y
```

CAUTION

Check with the system administrator to ensure you can keep the changes to the configuration file.

- d. Exit sysgen and reboot according to local convention:

```
sysgen> exit
```

Verifying the Connection

Additional information regarding the configuration and verification of libraries is provided in the *Legato NetWorker Installation Guide* (MPE/iX version) for the NetWorker Storage Node product.

Identifying the Post-Installation Tasks

After you install and configure the library, you must complete the following setup tasks from the library's front panel:

- **Setting the date and time:** When you first set up the library or if it has been disconnected for an extended period of time (around 8 days), set the library's real-time clock. See "Setting the Date and Time" on page 3-21 for more information.
- **Setting the mailslot configuration:** The default setting is for a one-slot mailslot. You can select a 0, 1, 5, or 10-slot mailslot. See "Configuring the Mailslot" on page 3-6 for more information.
- **Configuring the library for web monitoring:** You can monitor and manage your library anywhere on the network through user-friendly web pages. See "Using the Remote Management Card" on page 3-9 for more information.
- **Enabling the password:** The library does not have a password enabled when it arrives. To ensure security, enable and select a password. Be sure to document this password. See "Enabling and Changing the Password" on page 3-5 for more information.

NOTE

You must first set a library password through the front panel to configure the library using the remote management card (see "Enabling and Changing the Password" on page 3-5).

Moving or Shipping the Library

WARNING

Do not move the library without additional help or an appropriately rated lift device. The 20-slot weighs 40.9 kilograms (90 pounds). The 40-slot weighs 76.4 kilograms (165 pounds). The 60-slot weighs 104.1 kilograms (229 pounds).

NOTE

During normal operation, changes to configurations are stored in Non-Volatile (NV) RAM for eight days. All configuration settings can be permanently saved to flash memory by power cycling the library. This allows the settings to be recovered if the library is unplugged for more than eight days. If this step is not completed and the library is unplugged for more than eight days, any new settings may be lost. Before shipping the library, verify that the configuration settings were saved permanently by first powering down the library, and then powering back up to store the settings and to view them.

To move or ship the library:

1. Verify that all drives are empty.
2. If a drive contains a tape, unload it. Refer to the backup software documentation, use the remote management card (page 3-9), or use the front panel menu as follows:
 - a. From the **Drive and Tape Operations** menu, select **Unload Tape from Drive**.
 - b. Use the [-] or [+] keys to select the drive you want to unload.
 - c. Select **[Unload]** to move the tape from the drive to the tape's original location (the slot it occupied before being loaded into the drive). If that slot is occupied, you will be asked to select another slot location.

The tape automatically rewinds before it is unloaded. A status screen displays the library's progress as the tape is relocated.

- d. From the **Drive and Tape Operations** menu, select **[Back]** to return to the **Operations** menu.

3. If shipping the library, remove tape cartridges from the magazines:
 - a. From the **Magazine Access** menu, select one of the following options:
 - **Unlock Door**
 - **Unlock All Doors**

Use the [-] or [+] keys to change the door selection.
 - b. Pull the unlocked door(s) out to access magazines and tapes. The door may also be key locked. Unlock the door if needed.
 - c. Remove the magazine by lifting it straight up with the handle.
 - d. To remove a tape, set the magazine on its back and grasp the top and bottom corners of the tape. Pull the tape straight out of the magazine and return the magazine to the library.
4. If shipping the library, lock the transport:
 - a. From the **Administration** menu, select the **Run Test** menu.
 - b. From **Run Test**, use the [-] or [+] keys to select **Lock Transport**.
 - c. Select **[OK]**.
 - d. Select **[Run]**. The front panel display will indicate that the transport has been locked.

CAUTION

Do not power off the library until the interface is inactive. Removing power from a SCSI or Fibre Channel peripheral when the bus is active can result in data loss and/or indeterminate bus states. If your computer is connected to a LAN, be sure to check with your system administrator before powering off the library.

5. Power off the library. The power “standby” switch is recessed to avoid accidental power cycles.
6. To ship the library, remove all external cords, cables, and terminators. For an internal move, only disconnect the power cables, SCSI cables, the RMC ethernet cable, and the Fibre Channel connection from the host, hub, or switch.

NOTE

You do not need to remove the SCSI cables that connect the controller or the Fibre Channel interface to the drive modules, unless the library is being shipped.

7. To move a stand-alone library, move it to its new location and reconnect it using the procedures in “Connecting and Powering on the Library” on page 1-24.
 - For shipping, place the library in the original packing materials.

NOTE

If you no longer have the original packaging, contact your service representative to obtain packaging materials, or order direct from Hewlett-Packard. The part numbers are listed in Table 1-5 on page 1-56.

- For libraries mounted in a rack, proceed to the next step.
8. Extend the rack’s anti-tip foot.

WARNING

Failure to extend the anti-tip foot could result in personal injury or damage to the library.

9. Open the magazine doors and loosen the screws that lock the library into place (Figure 1-14 on page 1-22). The screws are located in front of the trim brackets.
10. Remove the stop bracket. (See Figure 1-9 on page 1-18 and Figure 1-10 on page 1-19.)
11. Push the library out of the rack until it hits the latch stops (approximately 2/3 of the library is out of the rack).
12. Reattach the lifting straps to the sides of the library.
13. Release the library from the rack.
 - **40-Slot and 60-Slot Libraries:**

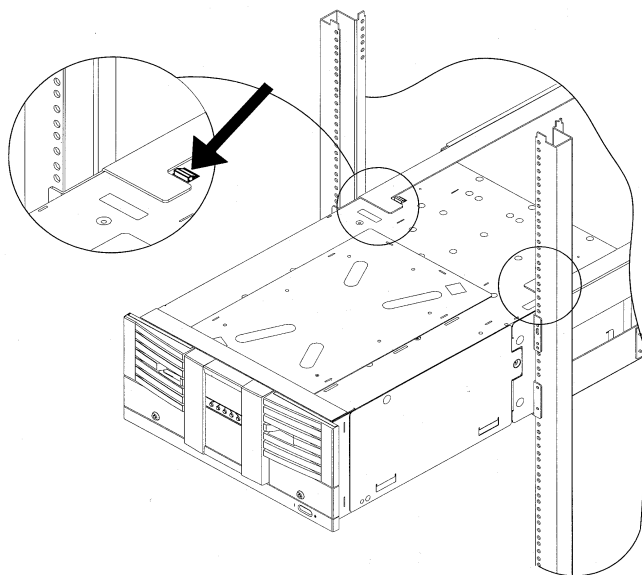
Depress the latch stops at the top of the library with a screwdriver or similar tool (Figure 1-26 on page 1-55).

- **For the 20-slot library:**

If the library does not have enough clearance above for a tool to be inserted, unscrew the four screws (two on each side) from the top (black) mounting rail on the front of the library. Pull the library partially out, then lower the front half of the library to ease it under the latch stops.

Figure 1-26

Latch Stops



14. Remove the library from the rack.

- **20-Slot Library:**

With the help of two people or a lift, slide the library out of the rack and place it in the original packaging materials.

- **40-Slot and 60-Slot Libraries:**
 - a. Position the original shipping pallet in front of the rack.
 - b. With at least one person on each side, slide the library out of the rack and onto an appropriately rated mechanical lift. Lower the library onto the shipping pallet.

NOTE If you no longer have the original packaging, contact your service representative to obtain packaging materials, or order direct from Hewlett-Packard. Packaging part numbers are listed in Table 1-5.

Table 1-5 Packaging Part Numbers

	20-Slot	40-Slot	60-Slot
Standalone	C7206J	C7218J	C7234J
Rackmount	C7207J	C7219J	C7241J

2 Library Operations

Chapter Overview

This chapter describes the following:

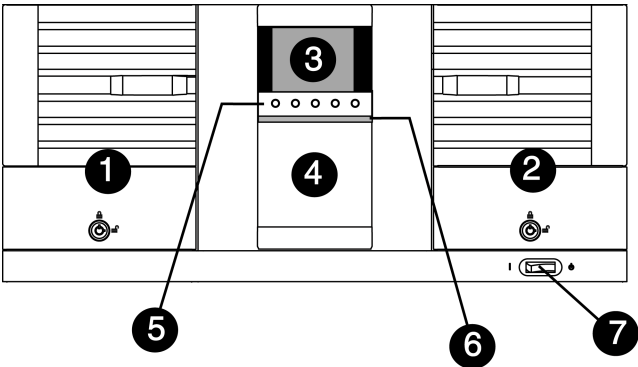
- Front Panel Overview
- Understanding the Menu Structure
- Using Tapes
- Accessing Tapes in the Library
- Drive and Tape Operations

Front Panel Overview

The front panel is the local control device for the library, and is located on the front of the library. LED bar beneath the front panel display indicates library activity.

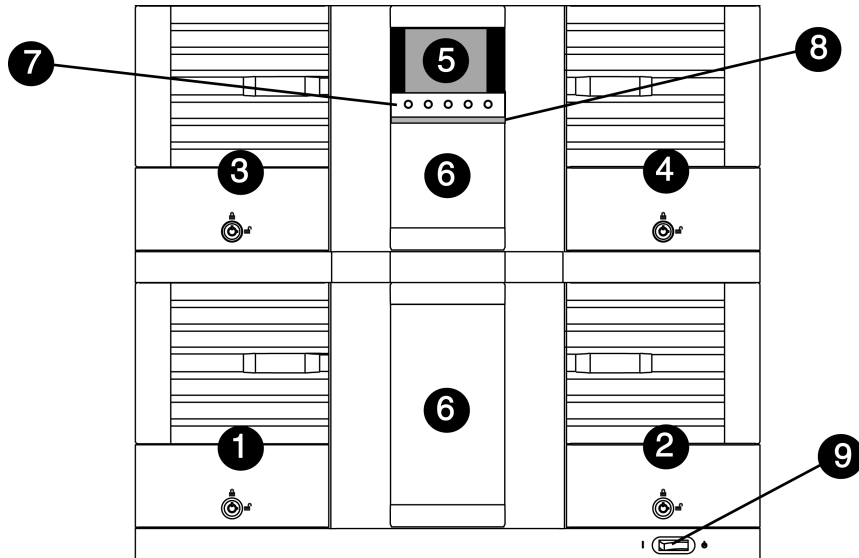
- Green = library is ready and idle
- Flashing Green = library or drive is active
- Amber = library is partially available and idle (see page 4-8)
- Flashing Amber = library failed (see page 4-13)

Figure 2-1 20-Slot Library Front Panel



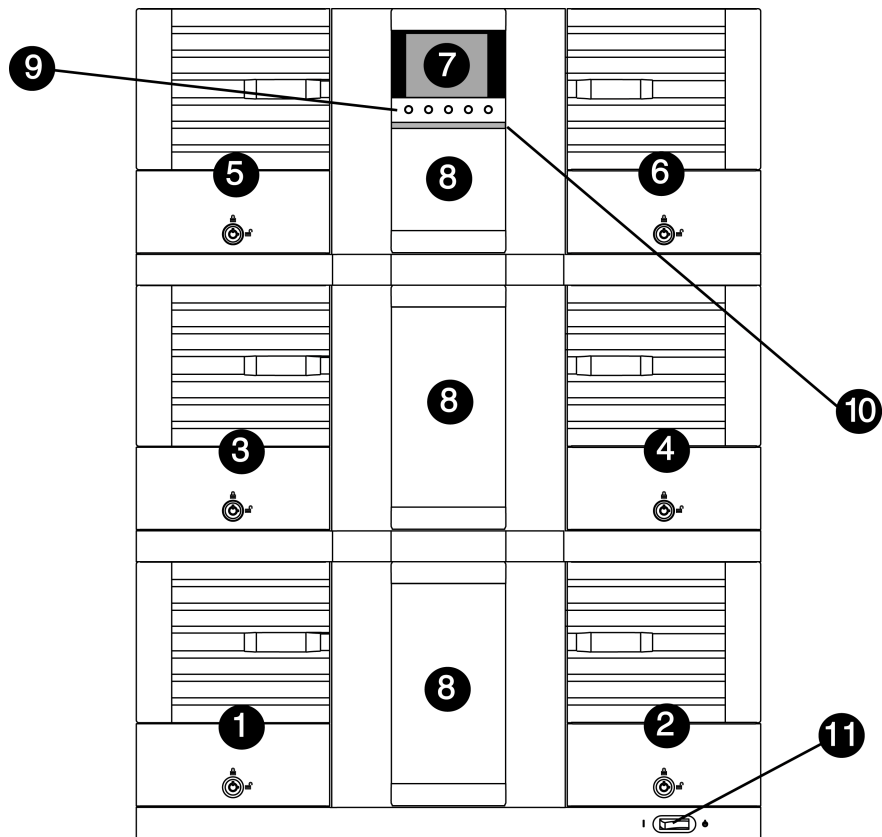
1	Door 1 with lock (slots 1-10 with slot 1 at the front)	5	Soft keys
2	Door 2 with lock (slots 20-11 with slot 20 at the front)	6	Front panel LED
3	Front panel display	7	Power (standby) switch
4	Viewing window		

Figure 2-2 40-Slot Library Front Panel



1	Door 1 with lock (slots 1-10 with slot 1 at the front)	6	Viewing windows
2	Door 2 with lock (slots 20-11 with slot 20 at the front)	7	Soft keys
3	Door 3 with lock (slots 21-30 with slot 21 at the front)	8	Front panel LED
4	Door 4 with lock (slots 40-31 with slot 40 at the front)	9	Power (standby) switch
5	Front panel display		

Figure 2-3 60-Slot Library Front Panel

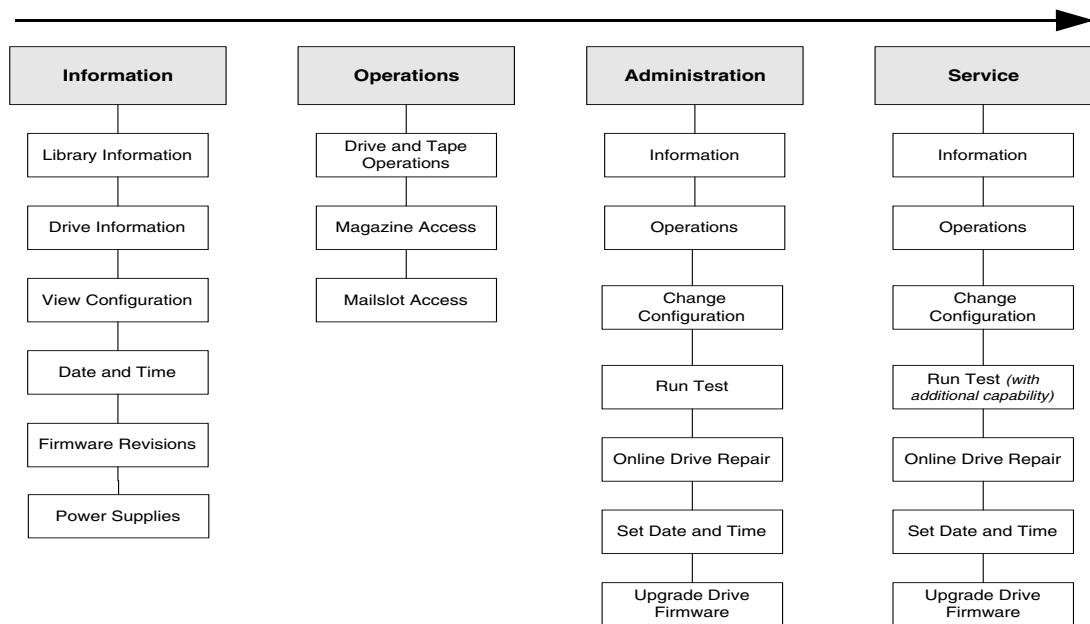


1	Door 1 with lock (slots 1-10 with slot 1 at the front)	7	Front panel display
2	Door 2 with lock (slots 20-31 with slot 20 at the front)	8	Viewing windows
3	Door 3 with lock (slots 41-50 with slot 41 at the front)	9	Soft keys
4	Door 4 with lock (slots 60-69 with slot 60 at the front)	10	Front panel LED
5	Door 5 with lock (slots 79-88 with slot 79 at the front)	11	Power (standby) switch
6	Door 6 with lock (slots 98-107 with slot 98 at the front)		

Nesting

Each level of password-protected menus (**Administration** and **Service**) includes all options available in the subordinate menu. For example, all options available in the **Administration Menu** are also included in the **Service Menu**. This functionality reduces the need to return to the **Main Menu** or re-enter a password. Figure 2-4 illustrates the “nesting” concept of increasing levels of library control.

Figure 2-4 **Nesting**



NOTE

The front panel defaults back to the Home screen after approximately three minutes of inactivity, unless an error message or confirmation message is displayed that needs to be acknowledged.

Front Panel Display Conventions

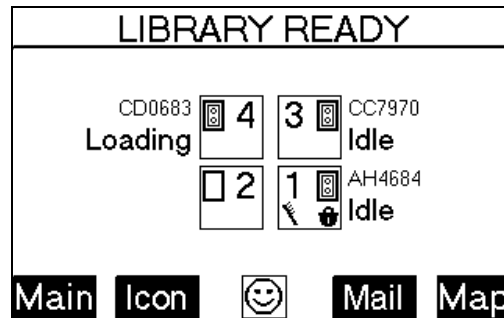
The front panel displays icons and text that provide library, drive, and tape status information. It also uses text prompts and warnings to guide you while making changes. The soft-key labels vary between screens. Use the key immediately below the label to execute the desired function.

Front Panel Status Information (Home Screen)

Figure 2-5 shows a typical Home screen view, using the 40-slot library as an example.

Figure 2-5

Home Screen (Example of 40-Slot Library)



The Home Screen shows the following:

- Statement indicating the general condition of the library
- Drive and tape status
- Tape bar code (if applicable)
- **[Main]** option to go to the **Information, Operations, and Administration** menus
- **[Icon]** option to display the icons with a description
- An icon that indicates the general status of the library. This icon may display a reverse video reminder (icon background reverses to black) when there has been a change in the status of the library. Select this key to obtain more information about the library.
- **[Mail]** option to access the mailslot
- **[Map]** option to access information about the drive and tape slots

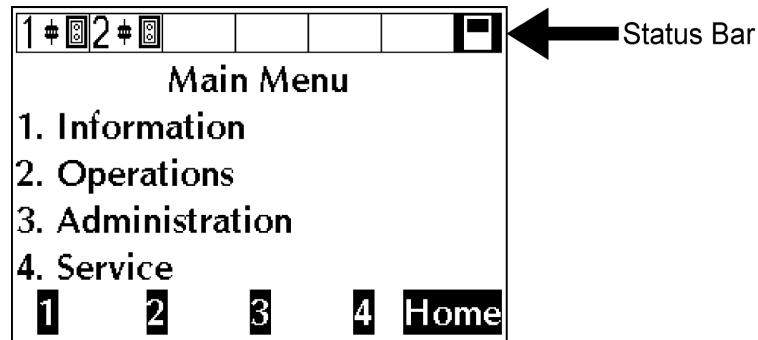
Status Bar

All screens, except the Home and Map screens, show a status bar that summarizes library and drive status (Figure 2-6).

The status bar shows a reverse video reminder (icon background reverses to black) for drive or library errors that have been entered in the media log or hard error log. You may clear this reminder by viewing either the **Drive Log** or **Library Hard Error Log** screens.

The library's reverse video reminder will also be set if the library's partial availability status changes (see "Partial Availability State" on page 4-8). You can clear this reminder by viewing the **Library Status** screen by selecting the center icon button on the Home screen.

Figure 2-6 Status Bar from Main Menu Screen



The status bar can display the icons listed in Table 2-1 and Table 2-2.

Table 2-1

Drive Icons

	Power is off		Online
	Failed, offline		Full and idle
	Needs to be cleaned		Unloading a tape
	Offline		Seeking data on a tape
	Failed, online		Writing data to a tape
	Tape is cleaning a drive		Rewinding a tape
	Tape is write-protected		Reading a tape
	Empty		Erasing a tape
	Loading a tape		

Table 2-2

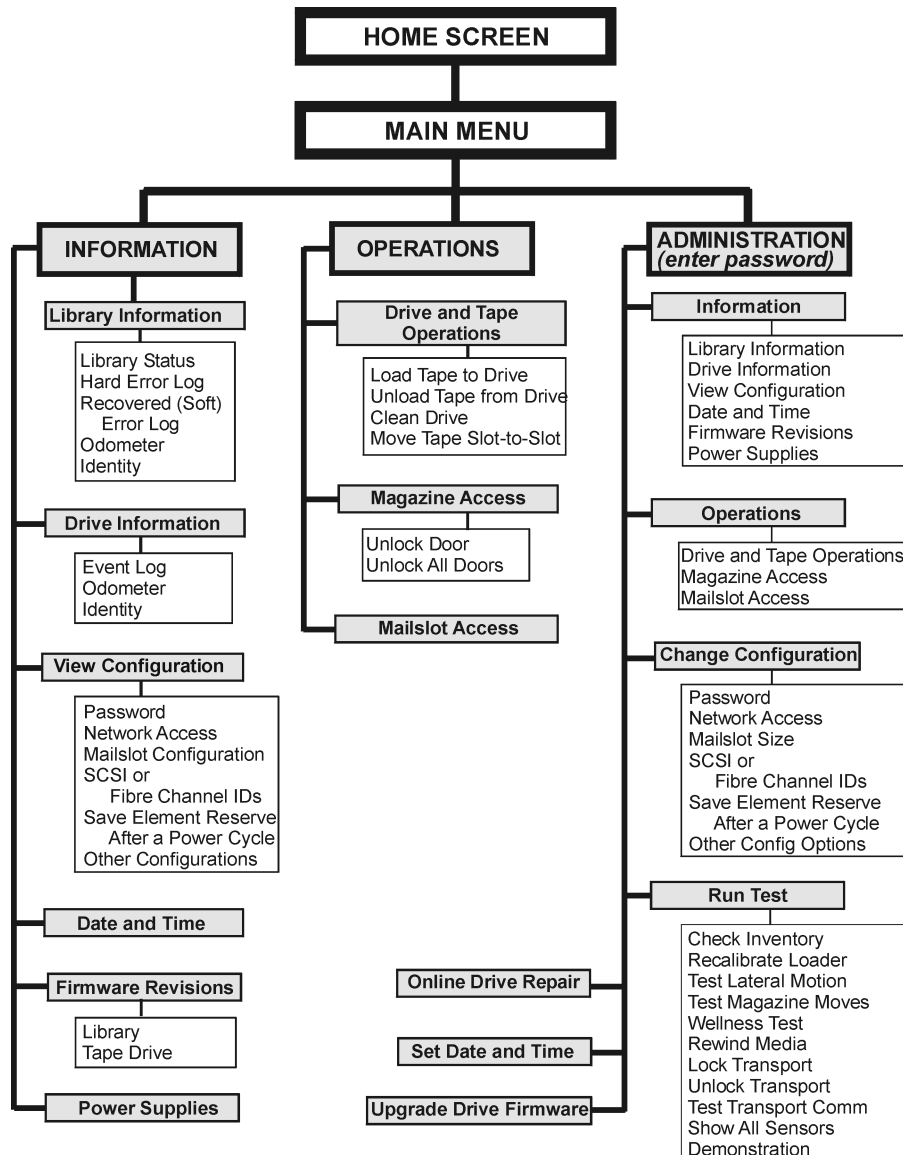
Library Icons

	Failed		Partially available ^a
	Healthy		

a. Library is partially available: the library is not in optimum configuration. Refer to “Partial Availability State” on page 4-8.

Understanding the Menu Structure

Figure 2-7 Front Panel Menu Structure



Using Tapes

CAUTION

It is critical to ensure that the media you use matches the format of your tape drive. Cleaning cartridges and formatted data cartridges are unique for each drive technology. Damage may occur if inappropriate media is used in tape drives.

The library has a mixed media feature that allows the use of two drive technologies in the same library. For more information, refer to Appendix D.

NOTE

This section includes general information on using tape cartridges. For more information on using media for your drive type, refer Appendix D.

Write-Protecting Tape Cartridges

The use of the write-protect switch ensures data safety for files that have been previously written to tape, preventing additional files from being written to that tape.

For more information on how to write-protect your tapes, refer to the documentation provided with your tape cartridges or to Appendix D.

Labeling Tape Cartridges

Make it a practice to use bar code labels on your tape cartridges. Your host software may need to keep track of the following information and the associated bar code:

- Date of format or initialization
- Cartridge owner (such as group or department)
- Storage purpose

TIP

If the host software does not keep track of this information, create a method for doing so.

NOTE

Bar code labeling requirements vary and are dependent on the type of tape drive used with your library. For more information on these requirements, refer to Appendix D.

Maintaining Tape Cartridges

DO NOT:

- Expose tape cartridges to magnetic fields.
- Leave cartridges in the drive when library power is off.
- Expose cartridges to extreme temperatures or humidity. For acceptable operating and storage temperatures, refer to the documentation provided with your media.
- Expose cartridges to moisture or direct sunlight.
- Drop the tape cartridges or subject the cartridges to any physical shock.
- Open the tape cartridge lid and expose the tape to possible contamination or physical damage.
- Touch the tape surface.
- Take the tape cartridges apart.
- Use graphite pencils, water soluble felt pens, or other debris-producing writing instruments to label tape cartridges.
- Erase a label; replace it instead.

DO:

- Remove dust on the outside of tape cartridges with a damp cloth.
- Store cartridges vertically, not horizontally.
- Store tape cartridges in their plastic containers and in appropriate environmental conditions per the documentation provided with your media.

Accessing Tapes in the Library

Tapes in the library may be accessed using the following features:

- Magazine access
- Mailslot access (if configured, see “Configuring the Mailslot” on page 3-6 for configuration information)

Magazine Access



1. From the **Magazine Access** menu, select one of the following options:
 - **Unlock Door**
 - **Unlock All Doors**

Use the [-] or [+] key to change the door selection.

NOTE

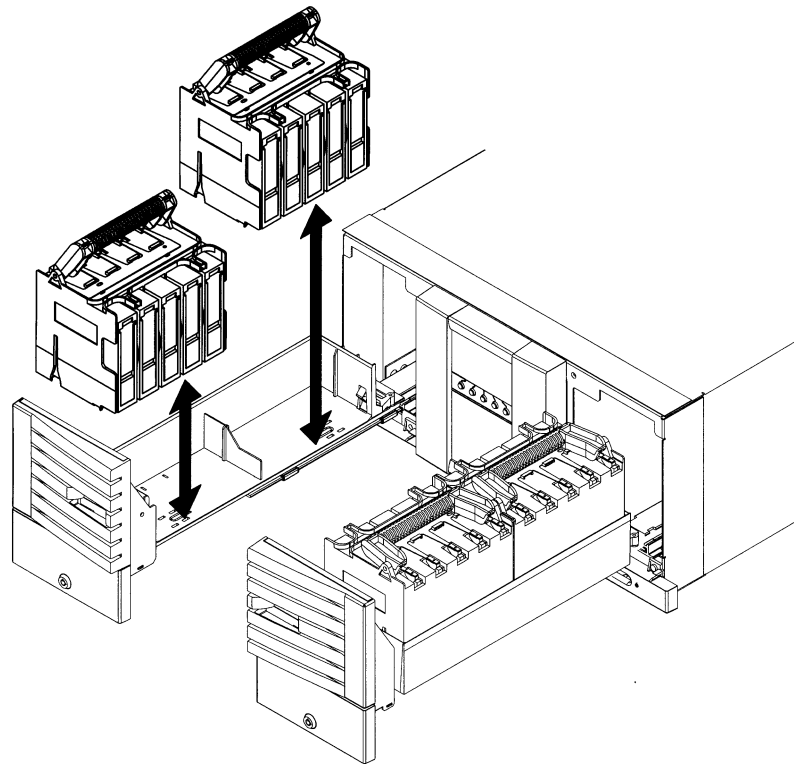
Unlocking only the required door, instead of all doors, will reduce the time required for the library to check inventory.

2. Pull the unlocked door(s) out to access magazines and tapes. The door may also be key locked. Unlock the door if needed.

NOTE

Select [**Lock**] to re-lock the doors that have been unlocked, but not opened.

Figure 2-8 **Removing/Replacing a Magazine**



3. Remove the magazine by lifting it straight up with the handle (Figure 2-8).
4. To remove a tape, set the magazine on its back and grasp the top and bottom corners of a tape. Pull the tape straight out of the magazine.
5. If desired, insert tapes into the magazine. Ensure that you use the appropriate tape type for the magazine. Push the tape into the slot until it “clicks” into place. (For more information, refer to Appendix D.)
6. Reload the magazine into the door tray, and close the door. The library will run an inventory check on the contents of that tape door.

NOTE

If the library does not have all magazines, it will report a partial availability message (see “Partial Availability State” on page 4-8).

Mailslot Access

NOTE

The mailslot is located in the upper right-hand door of the library.

The mailslot can be accessed from the **Operations** sub-menu or from the Home screen.



1. The **Mailslot Access** screen displays a message indicating the number of tapes in the mailslot and how to open the appropriate door.

Open the door. The door will open only to the number of storage slots that have been configured for the mailslot (see “Configuring the Mailslot” on page 3-6).

2. Close the door. The library automatically detects the closure, locks the door, and initiates an inventory check.

Drive and Tape Operations

Main Menu ->

Operations ->

Drive and Tape Operations

Look at the product information labels on the back of the library and the labels inside each tape door for more information about drive and slot numbering. The numbering scheme is also illustrated in “Front Panel Overview” on page 2-3 and “Library Back Panel” on page 1-24.

NOTE

The “Home” and “Map” front panel screens illustrate the drive, slot, and mailslot numbering schemes. Slot numbers displayed in reverse video indicate those reserved for the mailslot.

Loading a Tape Into a Drive

1. From the **Drive and Tape Operations** menu, select **Load Tape from Drive**.
2. Use the [-] or [+] key to select any slot. Only full slots are available for selection.

Select **[OK]**.

3. Use the [-] or [+] key to select the desired drive. You can only select empty drives that match the tape type.
4. Select **[Load]** to move the tape from a slot to a drive.

A confirmation screen indicates that the tape is loaded.

NOTE

You can also load tapes into drives from remote access. See “Using the Remote Management Card” on page 3-9.

Unloading a Tape from the Drive

1. From the **Drive and Tape Operations** menu, select **Unload Tape from Drive**.
2. Use the [-] or [+] keys to select the drive you want to unload.
3. Select **[Unload]** to move the tape from the drive to the tape's original location (the location it occupied before being loaded into the drive). If that slot is occupied, you will be asked to select another slot location.
4. The tape automatically rewinds before it is unloaded. A status screen displays the library's progress as the tape is relocated.
5. From the **Drive and Tape Operations** menu, select **[Menu]** to return to the **Operations** menu.

NOTE

Tapes can also be unloaded from remote access. See "Using the Remote Management Card" on page 3-9.

Cleaning a Drive

Main Menu ->

Operations ->

Drive and Tape Operations

NOTE

Use a cleaning cartridge to clean a drive. The drive mechanism should only be cleaned if the *clean drive* icon displays (see Table 2-1 on page 2-9).

CAUTION

Ensure you use the correct cleaning cartridges for your tape drive. Damage may occur if inappropriate media is used. For more information, refer to Appendix D.

1. From the **Drive and Tape Operations** menu, select **Clean Drive**.
2. From **Choose Cleaning Slot**, use the [-] or [+] key to select the slot location of the cleaning tape. Refer to the label inside the library door, the front panel display, or “Front Panel Overview” on page 2-3 for a list of the slot numbers.

Select **[OK]**.

3. Using the [-] or [+] keys, select the number of the drive to be cleaned.

Select **[Clean]**.

When the cleaning process is complete, the cleaning tape will be returned to the original slot location. If the cycle failed, the screen will display the appropriate status information. See “Troubleshooting Common Problems” on page 4-27 for possible cleaning problems.

NOTE

Drives can also be cleaned from remote access. See “Using the Remote Management Card” on page 3-9.

Moving Tapes Between Slots

Main Menu ->

Operations ->

Drive and Tape Operations

1. From the **Drive and Tape Operations** menu, select **Move Tape Slot-to-Slot**.
2. Select the slot where you want to move the tape *from* using the [-] or [+] keys, and press **[OK]**.
3. Select the slot where you want to move the tape *to* using the [-] or [+] keys, and press **[OK]**. A message will display if the destination slot chosen is reserved or is the original “home” slot for a tape in the drive.

A status screen indicates the tape is being moved.

3 Library Administration

Chapter Overview

This chapter describes the following:

- Configuring the Library
- Enabling and Changing the Password
- Configuring the Mailslot
- Using the Remote Management Card
- Configuring the Library for Fibre Channel
- Setting SCSI IDs
- Setting the Date and Time
- Retrieving Library Information
- Running Library Diagnostic Tests

Configuring the Library

Main Menu ->

Administration ->

Change Configuration

You can change the following configuration options for the library:

Table 3-1 Configuration Options

Menu Item	Description	Default	Options
Password	See “Enabling and Changing the Password” on page 3-5.	Off	On or Off
Network Access	See “Using the Remote Management Card” on page 3-9.	DHCP Off	Assign an IP address or use DHCP
Mailslot Configuration	See “Configuring the Mailslot” on page 3-6.	One-slot	None, one, five, or ten slots
Fibre Channel or SCSI IDs	See “Configuring the Library for Fibre Channel” on page 3-15 or “Setting SCSI IDs” on page 3-19.	N/A	N/A
Save Element Reserve After a Power Cycle	Allows the host to continue reserving drive or slots after a power cycle (a SCSI element reservation). This is typically used to ensure that only one host can access a slot or drive. See “Configuration Information” on page 3-26.	Off	On or Off

Table 3-1 Configuration Options

Menu Item	Description	Default	Options
Other Configuration Options (see page 3-26)	• Report Recovered (Soft) Errors: Reports recovered errors over SCSI.	On	On or Off
	• Restore Factory Defaults: Restores the default configuration settings (see Table 3-2).	N/A	N/A
	• Prevent Media Access: Locks the library doors and prevents front panel access.	Off	On or Off

Factory default configuration settings are listed in Table 3-2.

Table 3-2 Default Configuration Settings

Description	Setting
Library controller SCSI ID (see page 3-19)	0
Drives 1-6 SCSI IDs (see page 3-19)	1-6
Clean count (see page 2-17)	0
Report recovered errors (see page 4-6)	On
Cleaning cartridge location (see page 2-17)	Unknown
Mailslot configuration (see page 3-6)	1
All online drive repair states (see page 4-54)	Online pending
Prevent media access (see Table 3-1, “Other Configuration Options”)	Off
Hard error, soft error, drive media, library event, and recovery logs (see page 4-5)	Cleared
All move stored heights and offsets	Returned to default positions

Enabling and Changing the Password

NOTE

Administration procedures can be password protected. These procedures include: diagnostic tests, configurations, online drive repair, and setting the date and time. A password is also required for administration through the remote management card.

Main Menu ->

Administration ->

Change Configuration ->

Password

When the library is first installed, the password is inactive. To protect the system from unauthorized access, use the following procedure to set a password.

1. Enter the **Password** menu. A status screen will indicate if a password is enabled.
 - If the password is turned off, select **Set New Password** to enable the password.
 - If the password is turned on, select **Change Password** to enter the new password. It must be exactly eight digits.
 - If the password is turned on, select **Turn Password Off** to clear the password.

NOTE

If you enter more than eight digits, the ninth digit will become the first digit of the new password.

2. Select **[OK]** to exit.

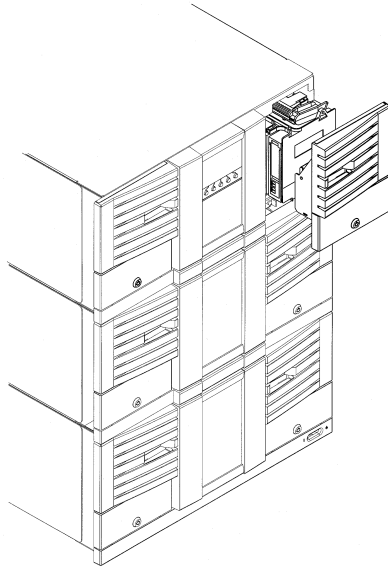
CAUTION

Be sure to document the password. If you forget the password, contact your service representative.

Configuring the Mailslot

The mailslot is comprised of magazine locations in the upper right-hand door. When a tape is being changed, the door opens only to the number of slots that have been configured.

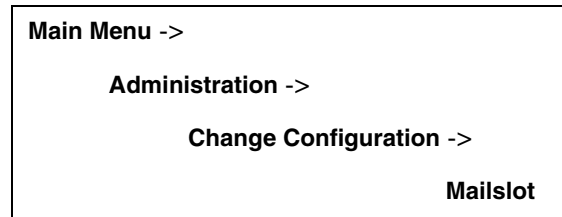
Figure 3-1 **Mailslot Door**



By default, the library is configured for a one-slot mailslot. This setting can also be configured for 0 slots (no mailslot), five slots, or 10 slots from the **Administration** or **Service** menus (see Table 3-3, “Mailslot Configuration,” on page 3-7).

Table 3-3 Mailslot Configuration

Number of Mailslots	Advantages and Disadvantages
0	Magazine access must be used to exchange tapes (see “Magazine Access” on page 2-13). • <i>Advantage:</i> Allows all slots to be used for data storage. • <i>Disadvantage:</i> Cannot easily remove or add tapes without a full inventory check.
1	A mailslot setting of 1 (one) allows one slot to be designated as the mailslot. • <i>Advantage:</i> Opens only to the designated slot, which simplifies the manual tape exchange procedure. • <i>Disadvantage:</i> Reduces the library’s storage capacity by one tape.
5	A mailslot setting of 5 (five) designates five slots, one magazine, as the mailslot. • <i>Advantage:</i> Provides access to a magazine of tapes, which simplifies the manual tape exchange procedure. • <i>Disadvantage:</i> Reduces the library’s storage capacity by five tapes.
10	A mailslot setting of 10 (ten) designates ten slots, two magazines, as the mailslot. • <i>Advantage:</i> Provides access to two magazines of tapes, which simplifies the manual tape exchange procedure. Also, if you have more than one drive technology in your library, each magazine could be for a different tape type. • <i>Disadvantage:</i> Reduces the library’s storage capacity by 10 tapes.



Before changing the mailslot configuration, verify the slots that will become the mailslot are empty and not the original location of a tape in a drive.

Use the following steps to configure the mailslot option.

1. In the **Configure Mailslot** menu, a message will remind you to check the storage slot and mailslot configurations in the backup software.

Select **[OK]**.

2. The next screen will describe the prerequisites for configuring the mailslot. Verify these prerequisites have been met, then select **[OK]**.
3. The display will indicate the current mailslot setting. Select the number of mailslots desired (0, 1, 5, or 10). See Table 3-3 for information about each option.

A confirmation screen automatically displays the success or failure of the change and reminds you to reconfigure the backup software.

4. Select **[Done]** to exit.

CAUTION

Do not change the mailslot setting without reconfiguring your backup software. The backup software must reflect the mailslot setting to assist in tracking tape exchanges and the current location of all tapes. Verify that your backup software supports the mailslot configuration that you select.

Using the Remote Management Card

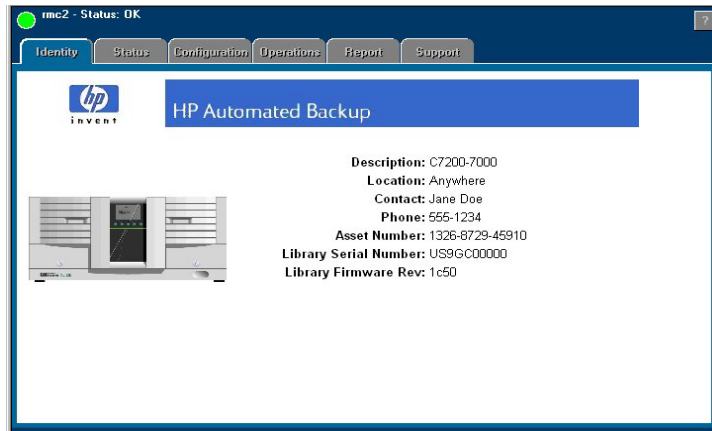
Overview

The remote management card (RMC) includes a Web-Based Library Administrator, which allows web management and monitoring of your library through a network connection. This interface allows you to monitor your library from anywhere on the network through comprehensive and user-friendly web pages. (See Figure 3-2.)

Online instructions are included on the web interface to describe how to use the tool. Simply select the [?] key in the upper right-hand corner to access the online help.

Figure 3-2

RMC Web Interface



The web-based remote management features allow you to obtain status reports and diagnostic information, as well as manage library functions from a remote location. All remote operations are password protected with the administrator password to prevent unauthorized access.

For remote management, you need a network connection and a browser to:

- View the current status of the library, drives, and tapes
- Manage multiple devices from any workstation within the intranet
- Manage and configure the library on your network in a secure environment to:
 - Clean the drives
 - Load and unload tapes
 - Run diagnostics
 - Restart the library
 - Dynamically assign the library's IP address, gateway address, and subnet mask using DHCP or BOOTP mode
- View library, drive, and tape error messages
- Generate error reports to fax or email to your support representative
- Download and install firmware
- Access web-based support, web registration, documentation, and partner information

Dynamic Host Configuration Protocol (DHCP)

DHCP allows a DHCP server to dynamically assign IP addresses to any DHCP client that requests one. The DHCP server usually has a limited set of IP addresses, and assigns them on a first come first serve basis. When a DHCP client boots up, it will broadcast a DHCP request over TCP/IP. If a DHCP server is present, that server will respond to the DHCP client with an IP address, subnet mask and gateway. This response also includes a lease (or expiration) time for the IP address being assigned. If the DHCP client then wants to use this address, the client must acknowledge the server's response, and then periodically renew the lease on that IP address. If the lease expires, the DHCP server is free to re-issue that IP address to another DHCP client.

NOTE

DHCP only manages dynamic allocation of IP addresses. Assigning device names with DHCP is not recommended.

BOOTP

BOOTP is similar to DHCP, in that a BOOTP server dynamically assigns an IP address to any BOOTP client that requests one. The difference is that your system administrator must preconfigure the BOOTP server for the library. The system administrator assigns a permanent IP address to the library's MAC address. When the library is booted, the BOOTP server responds and assigns the permanent address to the library. The IP address never expires and the BOOTP server will not reissue the IP address to any other BOOTP client.

Management Programs

In addition to using your browser directly to manage your library, you can also use popular management programs, such as HP OpenView, HP Top Tools, and CA Unicenter TNG. In order to best use HP OpenView and CA Unicenter TNG, you must download a plug-in from the HP Customer Care website at www.hp.com/go/support. This plug-in can be easily installed in your environment. HP Top Tools has built-in native support for your library, and no plug-in is required.

Table 3-4 Supported Configurations

Description	Supported Configurations
Browsers	• Windows 95/98/2000/NT: Internet Explorer™ 4.01 and higher, Netscape Communicator™ 4.5 and higher, and Netscape Navigator™ 4.08 and higher. • HP-UX: Netscape Communicator™ 4.5 and higher and Netscape Navigator™ 4.08 and higher. Internet Explorer™ is not supported. • Sun Solaris: Netscape Communicator™ 4.5 and higher and Netscape Navigator™ 4.08 and higher. Internet Explorer™ and HotJava™ are not supported.

NOTE

To correctly set caching for Internet Explorer™, go to the Windows Control Panel and select **[Internet]**. Click on the **[General]** tab. In the Temporary Internet Files section, click on the **[Settings]** button. Select **[Every Visit to the Page]**, and click on the **[OK]** buttons to exit. (Netscape Communicator™ and Netscape Navigator™ set caching automatically.)

Configuring the Remote Management Card

The library only requires one remote management card, which will already be installed when the library arrives.

NOTE

The library administrator password is required for this process. If the password is not set, you will not be permitted to configure your remote management card from your web browser. (See “Enabling and Changing the Password” on page 3-5.)

1. Connect to the network port of the card using a category 5 ethernet cable. Ensure that the cable is also connected to an active network port.
2. On the library's back panel, verify that the link LED on the remote management card is green. If the LED is not green, a link has not been established with the local network. Ensure the network port is active by checking with your system administrator. (See Table 4-3 on page 4-20 for a description of the LEDs.)
3. Enter the **Network Access** menu.

Main Menu ->

Administration ->

Change Configuration ->

Network Access

4. If you would like to use DHCP/BOOTP to configure your remote management card, select **[Yes]**. (See “Dynamic Host Configuration Protocol (DHCP)” or “BOOTP” on page 3-11.)
 - A message will display to confirm your configuration through DHCP/BOOTP, or alert you if DHCP/BOOTP failed.
 - If successful, note the IP address, and skip to step 9.
 - If DHCP/BOOTP was not successful, or if you do not want to use DHCP/BOOTP, contact your system administrator to obtain an IP address, subnet mask, and gateway address. Continue with step 5.

NOTE

The MAC address is unique to each remote management card and is used for identification. This address cannot be configured. To successfully use BOOTP from the library, your system administrator must first configure the BOOTP server using the MAC address. (See “BOOTP” on page 3-11.)

5. Enter the IP Address.

Use the **[+]** key to change the number.

Use the **[->]** key to move to the next number.

Use the **[Down]** key to move to the next address.

6. Enter the subnet mask using the same procedure.
7. Enter the gateway address.
8. Press **[OK]** when complete to save the changes, or press **[Quit]** to exit the menu and not save the changes. A message will display to confirm the changes you have entered or alert you if the changes have not been saved.
9. Enter the designated IP address into the web browser to launch the Web-Based Library Administrator pages.
 - **Example 1 - All modes (Manual, DHCP, or BOOTP):**
IP address = 15.28.33.12
http://15.28.33.12
 - **Example 2 - Manual and BOOTP only:**
Device name = library1
http://library1

NOTE

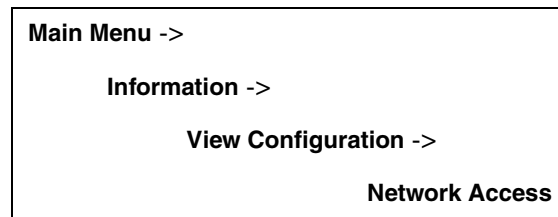
To use a device name, your system administrator must add the device name you select to the domain name server (DNS).

NOTE

Instructions and online help screens describing remote management are available from the Web-Based Library Administrator pages by selecting the [?] button in the top right-hand corner of any page.

Retrieving Information about the Remote Management Card

Enter the **Information** menu to view the following RMC settings:



- Network connection speed
- IP address
- Subnet mask
- Gateway address
- MAC address

Configuring the Library for Fibre Channel

NOTE

Refer to Appendix C if you are unfamiliar with Fibre Channel terminology before beginning this procedure.

The optional Fibre Channel interfaces in 20-slot, 40-slot, and 60-slot libraries serve as a bridge between SCSI and Fibre Channel.

NOTE

It is not necessary to connect the library to its Fibre Channel topology (arbitrated loop or fabric) before configuration.

Configuration

NOTE

When Fibre Channel interfaces are installed in the library, device SCSI IDs cannot be changed from their factory default.

Though you do not need to set SCSI IDs for Fibre Channel, you will need to configure Fibre Channel addressing.

Main Menu ->

Administration ->

Change Configuration ->

Fibre Channel

1. Enter the **Fibre Channel** menu.
2. Select the level where the Fibre Channel interface you want to configure is located.

Use the **[-]** key to select a lower level in the library.

Use the **[+]** key to select a higher level in the library.

Select **[OK]** if the level is correct.

3. A message displays the following information:

- Fibre Channel interface type (LVD or HVD SCSI)
- SCSI bus status

Select **[MORE]**.

4. A message displays information for the **CURRENT STATUS**, including:

- Link status
- Connection type (loop or fabric)
- AL_PA (Arbitrated Loop Physical Address) for loop connections, or a hex address for fabric connections

Select **[MORE]**.

5. A message displays information for the **CURRENT SETTINGS**, including the addressing assignment method (hard or soft) and the AL_PA for loop connections.

Select **[MORE]**.

6. A message displays information for the **FUTURE SETTINGS**. This allows you to input the addressing assignment method and AL_PA that you want to use at a later time, without affecting your current connection. *(Changes to the **FUTURE SETTINGS** will take effect on the next power up or board reset.)*

TIP

For multi-level libraries, settings can be changed simultaneously for each level of the library by changing the **FUTURE SETTINGS** and then power-cycling the library.

- The default addressing is hard addressing with auto-select enabled. Hard addressing allows you to set and maintain a fixed address, but may result in address conflicts. Soft addressing looks for an unused address on every power cycle, so the address might change.

NOTE

Since AL_PAs can change with soft addressing, some backup software applications may have difficulty locating the library in this mode. Check the backup software documentation to ensure soft addressing is supported before selecting this mode.

- If you selected hard addressing for a loop connection, select the AL_PA (fixed address) or choose auto-select. Auto-select is an option under hard addressing that selects an available address and then uses it as a hard address from then on.
7. Press **[OK]** when complete to save the changes, or select **[QUIT]** to return to the beginning of the fibre configuration menu. If you select **[QUIT]**, a message will display indicating the old values will be retained.

If you select **[OK]**, a message will display indicating that the settings are being stored onto the Fibre Channel interface. If this is successful, a message displays indicating that the new settings will be attempted *at the next restart*.

8. To immediately apply the new settings, select **[RESTART]**, or select **[DONE]** to wait until the next power cycle.

When the Fibre Channel interface is restarted, or when the library is power-cycled, **FUTURE SETTINGS** are copied into **CURRENT SETTINGS**. The Fibre Channel interface always attempts to connect using **CURRENT SETTINGS**.

- If you select **[RESTART]**, the Fibre Channel interface is restarted. *This should not be attempted if data transfers or library operations are in progress.* The **[RESTART]** operation normally completes within 90 seconds. The display will report the status of the operation when it is complete.

NOTE

The actual connection achieved depends on the external topology and network. Consequently, **CURRENT STATUS** may differ from **CURRENT SETTINGS**.

NOTE

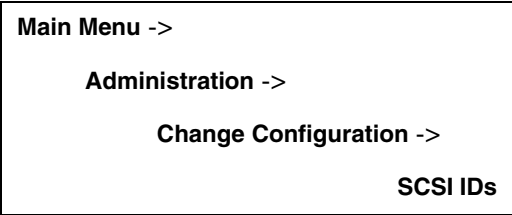
You can also change configuration from remote access. See “Using the Remote Management Card” on page 3-9.

Retrieving Information about Fibre Channel

Enter the **Information** menu to view information such as:

- Fibre Channel interface SCSI interface type (LVD or HVD)
- SCSI bus status
- Current status (link status, connection type, address)
- Current settings (addressing assignment method, AL_PA)
- Future settings (addressing assignment method, AL_PA)
- World wide node name
- World wide port name

Setting SCSI IDs



NOTE This menu is unavailable for libraries using Fibre Channel because the SCSI IDs are configured automatically.

Table 3-5 Default SCSI IDs

Device ^a	SCSI ID
Library controller	0
Drive position 1	1
Drive position 2	2
Drive position 3	3
Drive position 4	4
Drive position 5	5
Drive position 6	6

a. The number of drives depends on the library model.

NOTE Each device on the same SCSI bus must have its own unique SCSI ID.

CAUTION Changing SCSI ID settings from factory defaults may affect the backup software configuration. Consult your backup software manual for SCSI ID requirements.

Setting SCSI IDs

The SCSI ID for a drive position can be configured, even when no drive is present. When a drive is later added, it will use the ID already assigned to that location.

1. Enter the **SCSI IDs** menu. A message warns you that devices with the same SCSI IDs must be connected to different SCSI buses.

Select **[OK]**.

2. The **Configure SCSI ID** screen displays a message that indicates the drive position selected.

Use the **[-]** or **[+]** key to select the drive or library controller, then select **[OK]**. Refer to “Library Back Panel” on page 1-24 or the product information labels on the back of the library for the library’s drive numbering arrangement.

3. The next screen displays the drive number and the current SCSI ID.

Use the **[-]** or **[+]** key to select the desired SCSI ID, then select **[OK]**.

4. A confirmation screen will indicate either a successful or failed operation. If the SCSI ID assignment failed, the screen will indicate the reason and then return to the **Configure SCSI ID** screen.

NOTE

After changing SCSI IDs, you can save the new settings to flash ROM by power cycling the library, which allows the settings to be recovered if the library is powered off for more than eight days. If this step is not completed and the library is powered off for more than eight days, the new settings may be lost.

NOTE

You can also set SCSI IDs from remote access. See “Using the Remote Management Card” on page 3-9.

Setting the Date and Time

Main Menu ->

Administration ->

Set Date and Time

When the library is initially set up, or if it has been disconnected for more than eight days, you need to set the date and time. If the date and time are not set, error logs will not include date and time stamps. To set the date and time, enter the **Administration** menu. If you want to only view the date and time, enter the **Information** menu.

To set the date and time:

1. Enter the **Set Date & Time** menu.
2. Use the **[-]** or **[+]** keys to select the year, month, and day. Use the **[->]** to scroll to the next entry when complete.
3. Set the hour and minutes (00:00:00) using the **[+]** or **[-]** keys. Use the **[->]** key to scroll over to the next selection. The seconds are automatically set at 00.
4. Use the **[-]** or **[+]** keys to select the time zone. **UTC** stands for Coordinated Universal Time. (See Table 3-6, “World Time Zones,” on page 3-22.) This will keep your host time and library time synchronized.
5. Press **[OK]** to save your changes. Press **[Quit]** to exit this menu and not save your changes.

NOTE

The time does not automatically adjust for time changes such as daylight savings time and is accurate to within one hour per year. Occassional adjustment is normal.

Table 3-6 World Time Zones

UTC -12	Eniwetok, Kwajalein
UTC -11	Midway Island, Samoa
UTC -10	Hawaii
UTC -9	Alaska
UTC -8	Pacific Time (US and Canada), Tijuana
UTC -7	Mountain Time (US and Canada), Arizona
UTC -6	Central Time (US and Canada), Saskatchewan, Mexico City, Tegucigalpa
UTC -5	Eastern Time (US and Canada), Bogota, Lima
UTC -4	Atlantic Time (Canada), Caracas, La Paz
UTC -3	Brasilia, Buenos Aires, Georgetown
UTC -2	Mid-Atlantic
UTC -1	Atlantic Ocean
UTC	Great Britain, Lisbon, Monrovia, Casablanca
UTC +1	Berlin, Stockholm, Rome, Bern, Brussels, Vienna, Paris, Madrid, Amsterdam, Prague, Warsaw, Budapest
UTC +2	Athens, Helsinki, Istanbul, Cairo, Eastern Europe, Harare, Pretoria, Israel
UTC +3	Baghdad, Kuwait, Nairobi, Riyadh, Moscow, St. Petersburg, Kazan, Volgograd
UTC +3:30	Tehran
UTC +4	Abu Dhabi, Muscat, Tbilisi
UTC +4:30	Kabul
UTC +5	Islamabad, Karachi, Ekaterinburg, Tashkent
UTC +5:30	Mumbai, Calcutta, Madras, New Delhi, Colombo
UTC +6	Almaty, Dhaka
UTC +7	Bangkok, Jakarta, Hanoi
UTC +8	Beijing, Chongqing, Urumqi, Hong Kong, Perth, Singapore, Taipei
UTC +9	Tokyo, Osaka, Sapporo, Seoul, Yakutsk
UTC +9:30	Adelaide, Darwin
UTC +10	Brisbane, Melbourne, Sydney, Guam, Port Moresby, Vladivostock, Hobart
UTC +11	Magadan, Solomon Is., New Caledonia
UTC +12	Fiji, Kamchatka, Marshall Is., Auckland, Wellington

Retrieving Library Information

The following information is available from the **Information** and **Administration** menus:

- Library information
- Drive information
- Configuration information
- Date and Time
- Firmware revisions
- Power supplies

NOTE

This information is also available from remote access. See “Using the Remote Management Card” on page 3-9.

Library Information

Main Menu ->

Information ->

Library Information

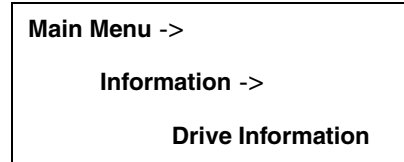
Use the following procedure to view information about the library. Table 3-7 on page 3-24 explains each option.

1. From the **Library Information** menu, select one of the following options:
 - **Library Status**
 - **Hard Error Log**
 - **Recovered (Soft) Error Log**
 - **Odometer**
 - **Identity**
2. Select **[Back]** to return to the **Library Information** menu.

Table 3-7 **Library Information**

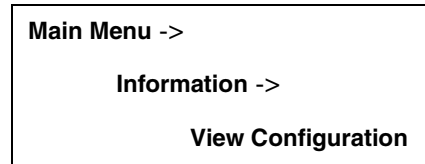
Menu option	Information
Library Status	Displays information about the overall status of the library and any partial availability flags. (See page 4-8 for more information on partial availability.)
Hard Error Log (page 4-13)	Displays a history of unrecovered errors. Returns a message indicating that there are no hard errors, or provides an error entry. Use the [Older] or [Newer] keys to select an entry.
Recovered (Soft) Error Log (page 4-6)	Displays a history of recovered errors (errors that were resolved by one or more automatic retries). Returns a message indicating that there are no soft entries or supplies an error entry. Use the [Older] or [Newer] keys to select an entry.
Odometer	Displays the number of times a tape has been moved from a slot (swaps).
Identity	Displays the library's serial number.

Drive Information



1. From the **Drive Information** menu, use the [-] or [+] keys to select the desired drive module.
2. Select **[OK]** to display and select one of the following options:
 - **Event Log:** Displays significant events for the selected drive position, including drive errors, online/offline transitions, and drive cleaning. This log is still available while a drive is being removed.
 - **Odometer:** Displays a count of cumulative power-on hours and drive loads.
 - **Identity:** Displays the drive type, serial number, and firmware revision.

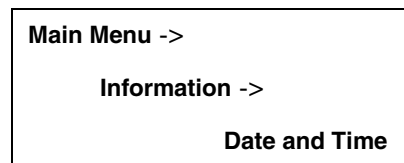
Configuration Information



From the **View Configuration** menu, select the desired library function to view current information about the following. (See page 3-3 for factory defaults.)

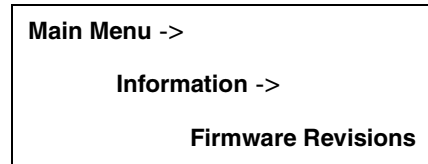
- Password enabled status
- Network access configuration
- Mailslot configuration
- SCSI ID assignments or Fibre Channel status
- Save SCSI element reserve after a power cycle
- Other configuration options (report recovered error logs and prevent media access)

Date and Time



Access this menu to view the library's settings for the date, time, and time zone. Use the **[Powered]** key to display the date and time of the last power on. (See page 3-21 for information on setting the date and time.)

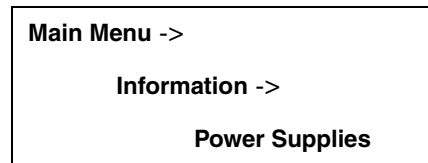
Firmware Revisions



From the **Firmware Revisions** menu, you can view information about the following (See page 4-60 for information on upgrading firmware):

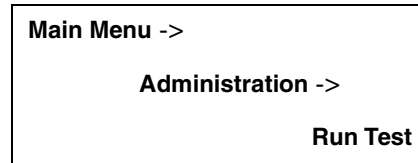
- Library
- Tape drives

Power Supplies



From the **Power Supplies** menu, you can view information about the status of your power supply and whether or not your library contains a redundant power supply.

Running Library Diagnostic Tests



Use the following procedure to run internal tests of library functions. Table 3-8 on page 3-28 describes these tests.

1. From **Administration**, select **[More]** to display additional administrative options. Select **[Run Test]**.
2. From **Run Test**, use the **[-]** or **[+]** key to view available tests.
3. Select **[OK]** to select the test.
4. Select the number of times this test will run.
5. Select **[Run]** to start the test cycle. The test results will display at the conclusion of the test cycle.

NOTE

Select **[Stop]** to abort a test. The current test cycle completes before the test stops. Stopping the test may take a few minutes.

Table 3-8

Front Panel Diagnostic Tests

Test	Description
Check Inventory	Physically scans the entire library to determine which slots and drives contain tapes and reads all bar code labels.
Recalibrate Library	Performs the power-up self-tests. Each test runs one time per test loop. This test recalibrates the mechanics and clears hard errors, but not the hard error log.

Table 3-8 Front Panel Diagnostic Tests

Test	Description
Test Vertical Motion	Moves the vertical assembly to the bottom of the library, then to the top, while the transport moves around its lateral range. Upon completion of these moves, the transport assembly then stops. NOTE: This test is functional in all library models, but only moves upward in multi-level libraries.
Test Lateral Motion	Moves the transport assembly to a random slot. No tape is required.
Test Magazine Moves	Moves a tape from a random slot to an empty, random slot, and then returns it to the original location.
Wellness Test	Moves a tape from a random slot to an empty drive, repeats the process until all drives are full, and then returns all tapes to their original slots.
Rewind Media	CAUTION: Do not run this test if the drive contains a tape that is receiving data from the host. Rewinds the tape in the drive.
Lock Transport	Locks the transport assembly in place to allow for shipping the library. Power down the library after running this test. Motion commands may fail if issued after the transport assembly is locked. NOTE: The transport assembly automatically unlocks when library is powered on.

Table 3-8 **Front Panel Diagnostic Tests**

Test	Description
Unlock Transport	Unlocks the transport assembly without power cycling the library. The transport must have already been locked to use this test. NOTE: The transport assembly automatically unlocks when library is powered on.
Test Transport Comm	Exercises the infrared communications path between the library controller and the transport controller. Reports the health of this link. If the test passes, the infrared communication link is good.
Show All Sensors	Dynamically displays the state of sensors. To toggle door sensors, open and close the doors. To toggle the mailslot sensor, open the mailslot to access the first two tapes.
Demonstration	CAUTION: <i>Run an inventory check from the host backup application after performing this test to ensure that tapes are returned to their original locations</i> Selects a random full storage slot, moves the tape to the drive, and repeats the process until all drives are full. The test locates a full slot, a full drive, an empty slot, and then performs an exchange.

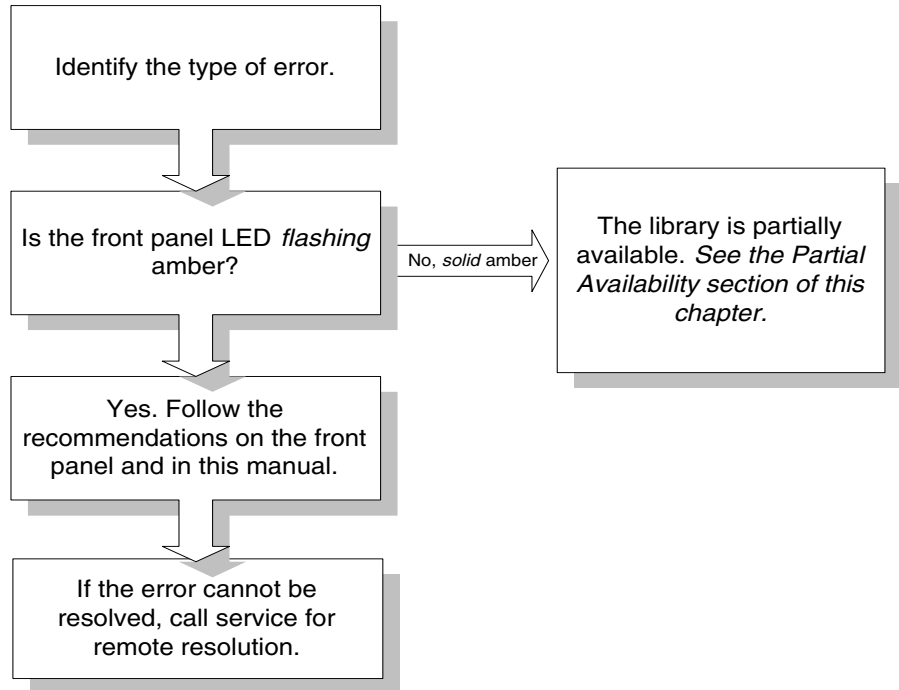
4 Troubleshooting, Removal, and Replacement

Chapter Overview

This chapter includes information on the following:

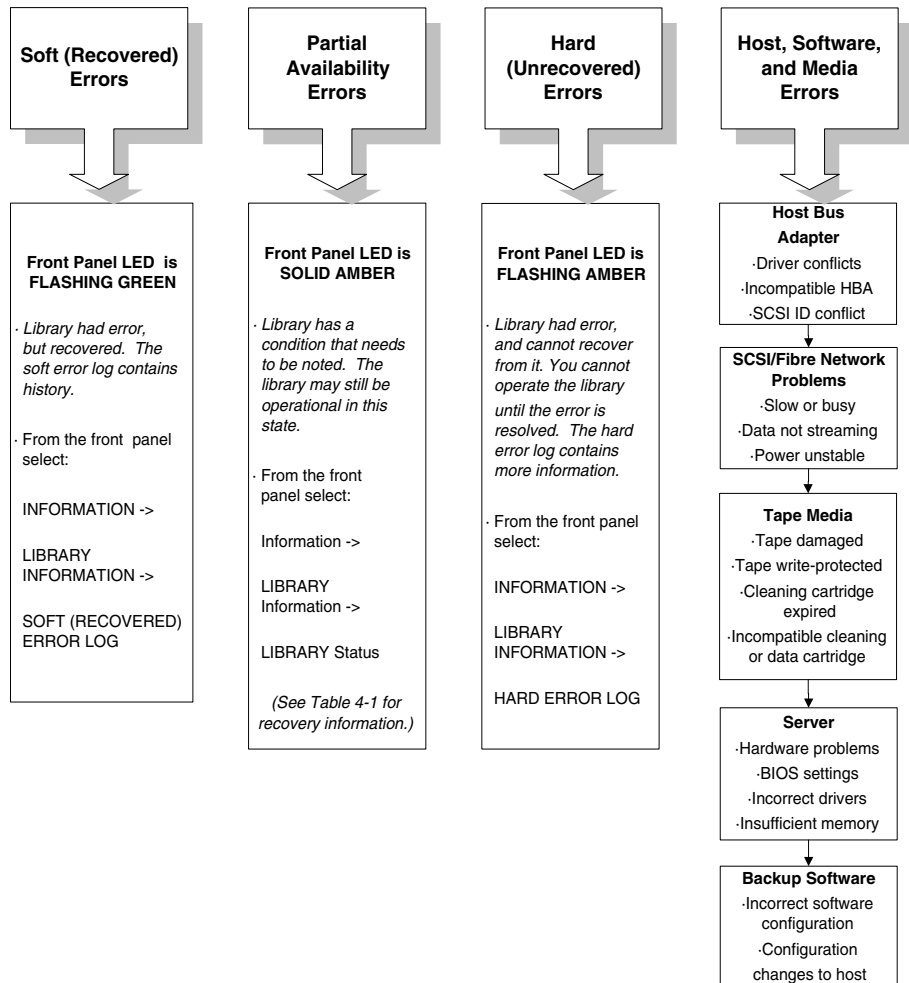
- Troubleshooting Overview
- Understanding Error States
- Interpreting Library LEDs
- Troubleshooting Common Problems
- Removing and Replacing Cards (for HP Authorized Personnel)
- Removing and Replacing Drive Modules (for HP Authorized Personnel)
- Upgrading Firmware

Troubleshooting Overview



Understanding Error Types

There are several categories of errors that might occur when you are using your library. Each error category has a different troubleshooting process, which is described in more detail later in this chapter.



Understanding Error States

This section describes the difference between the following types of errors:

- Soft (recovered) errors: page 4-6
- Partial availability: page 4-8
- Hard (unrecovered) errors: page 4-13
- Host software and media errors: page 4-15

Soft (Recovered) Errors

Soft errors are hardware errors that the library recovered from by retrying the operation.

Though soft errors are often transparent to a user, they are logged in the soft error log.

Main Menu ->

Information ->

Library Information ->

Soft (Recovered) Error Log

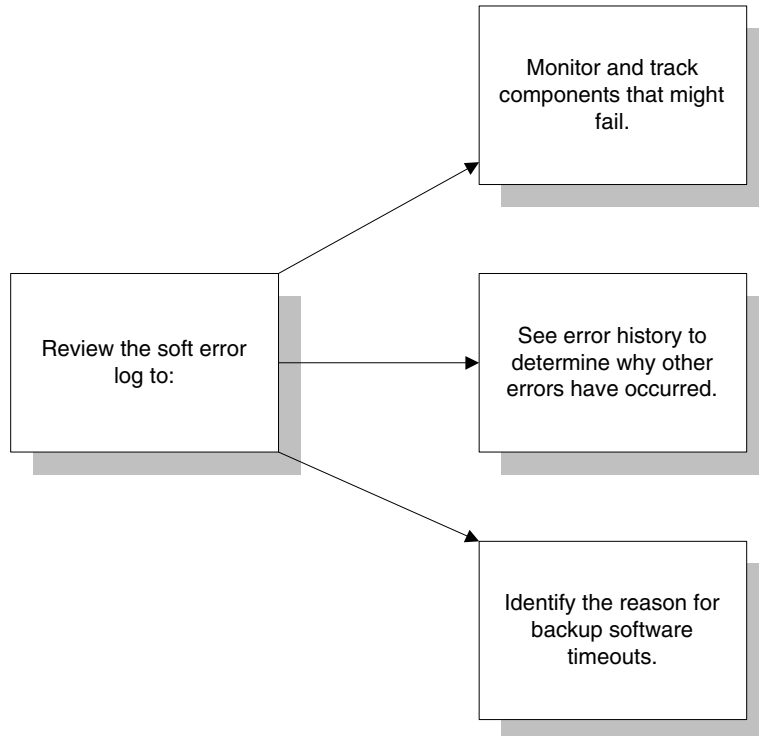
Periodically review the soft error log to detect and track errors before they become serious. If you see that a component has many soft errors, it might indicate a library component that is more likely to fail. If the library has a hard error and you are unsure what caused it, you can review the soft error log to help identify problem areas.

You can also use soft errors to identify the cause of software time-outs. The backup software on the host computer only allows a designated time for each operation. If the library takes longer than the backup software allows, it may be due to the library retrying a failed operation, which will show as a soft error.

TIP

The date and time stamp will help you resolve errors.

Figure 4-1 **Using the Soft Error Log**



Partial Availability State

When the library is in a partial availability state, it is still functional, but is not in an optimum or supported configuration, as described in Table 4-1 on page 4-9. When this occurs, the front panel will display **Partly Available**, and the illuminated bar beneath the front panel display will be solid amber until the condition is resolved.

NOTE

A partial availability state is most commonly an indication of a configuration issue and does not necessarily indicate a hardware failure.

The center icon button on the Home screen is a shortcut to the **Library Status** menu and partial availability information. This icon, as well as the icon on the status bar, shows a reverse video reminder (icon background reverses to black) when the library's partial availability status changes. You may clear this reminder by viewing the **Library Status** screen.

To view more information about the partial availability error, you can access the log by following this menu path:

Main Menu ->

Information ->

Library Information ->

Library Status

The partial availability state is caused by one of the conditions listed in Table 4-1. The condition will be displayed on the library front panel or the RMC Web-Based Library Administrator pages.

Table 4-1 Partial Availability Conditions

Library Status	Cause	Solution
Date and time not set	The date and time is not set on the front panel	Set the date and time. (See “Setting the Date and Time” on page 3-21.)
Drive(s) not present	The library could not detect all the expected drive modules. NOTE: This typically occurs because a drive was physically removed from the library. This may also occur for a brief time during an online drive repair. This condition will persist over a power cycle.	If a drive is present in the library: - Power off the library. - Reseat the drive module. - Power on the library. - Contact your service representative.
Drive(s) offline	Drive(s) taken offline because of the following: - Taken offline from front panel, host computer, or library controller. - Drive(s) failed power-on test. - Drive module board failed power-on test. - Failed serial communication to drive. - Failed to load/unload tape.	- Verify that the drive is online. If not, put drive back online from the front panel. - Power cycle the library. - Verify cabling and termination. - Check the error log from the front panel or RMC Web-Based Library Administrator pages for possible causes. - Contact your service representative.
Drive(s) online pending	Drive(s) are present and powered up, but have outdated firmware.	Update drive firmware. (See page 4-60.)
Drive firmware mismatch	Drives are present and powered up, but have different revisions of firmware.	Update drive firmware. (See page 4-60.)
Drive(s) needs cleaning	One or more drives need cleaning.	Clean the drive(s). (See page 2-17.)

Table 4-1 Partial Availability Conditions

Library Status	Cause	Solution
Drive(s) critical error	A critical error has occurred on a drive.	• Check the Drive Event Log from the front panel or RMC Web-Based Library Administrator pages for possible causes. • Contact your service representative.
Drive(s) not on Fibre Channel	Drive(s) are detected by library controller, but are not detected by any of the Fibre Channel interfaces.	• Verify that this is your intended configuration. • Verify that there are no broken or bent pins on the SCSI cables (for standard performance Fibre Channel interface only). • Tighten all SCSI cables and power cycle the library. • If problem persists, replace the SCSI cables. • Contact your service representative.
Firmware update needed	A library component has firmware that is different from the rest of the library.	• Update library firmware. (See page 4-60.)
Library fan failure	A library card cage fan has failed.	• Power cycle the library. • Contact your service representative.
Magazines(s) missing	Library could not detect all the magazines.	• Ensure that all magazines are present and correctly installed. (See “Removing/Replacing a Magazine” on page 2-14.)
Door(s) open	One or more tape doors are open. The library robotics will not move until the door is closed.	• Ensure that doors are closed.

Table 4-1 Partial Availability Conditions

Library Status	Cause	Solution
Incompatible magazine(s)	The magazine is incompatible with the drive type.	• Ensure that you use the correct magazine for your drive type. Refer to Appendix D for more information.
Mailslot open	Mailslot door is open. The library robotics will not move until the mailslot is closed.	• Ensure that the mailslot door is closed.
RMC not present	Library could not detect the remote management card.	• Power cycle the library. • Contact your service representative.
Front panel not present	Library could not detect the front panel display.	• Power cycle the library. • Contact your service representative.
Slave card not present	Library could not detect the library slave controller cards.	• Power cycle the library. • Contact your service representative.
Remote management card failed	Remote management card failed power-up test.	• Power cycle the library. • Contact your service representative.
Front panel failed	Front panel display failed power-up test.	• Power cycle the library • Contact your service representative.
Slave card failed	Library slave controller card failed power-up test.	• Power cycle the library. • Contact your service representative.

Table 4-1 Partial Availability Conditions

Library Status	Cause	Solution
Fibre Channel interface failed	Fibre Channel interface failed power-up test. (Usually due to problems on the SCSI bus, such as an LVDS drive or terminator on an HVDS bus, etc.)	• Verify that proper SCSI terminators and/or tape drives are attached to the Fibre Channel interface, and then reboot the library. • Power cycle the library. • Contact your service representative.
Power supply fault	Library detected one or more redundant power supplies in a failed condition.	• Determine which power supply has failed. See page 4-26 for LED status information. • Contact your service representative to replace the power supply.

Hard (Unrecovered) Errors

When a hard error occurs, the front panel will display an error message that indicates the problem, and the LED bar will be flashing amber. You cannot operate the library until this error is resolved.

TIP

This information can also be found in the latest entry of the hard error log.

View the hard error log to see the sequence of error events and more information on resolving the error condition. To view this log, access the following menu path from the front panel or press the center icon button.

Main Menu ->

Information ->

Library Information ->

Hard Error Log

TIP

The date and time stamp will help you resolve errors. When you review the error log, select **[Older]** to view error history and **[Newer]** to see more recent errors.

Use the following steps to resolve the problem:

1. From the screen with the initial error message or from the **Hard Error Log**, select **[More]** to retrieve more information about the error, which could include the following:
 - Time stamp or error event
 - Error code number
 - Library component that *potentially* caused the problem
 - Error code description
 - Recovery suggestions
 - Error code qualifier that provides more information on the type of error
 - Sequence numbers, which are used for factory diagnostics

Understanding Error States

2. Record all information from this screen for later reference.
3. Select **[More]**. Record the list of recommendations on this and any subsequent screens. *To retrieve this information after you exit, view the latest entry in the hard error log.*
4. Perform the recommendations in the order presented. Continue with each successive recommendation until the problem is isolated.
5. If the problem persists after implementing all of the recommendations presented on the front panel display, contact your service representative. (See Appendix B, “Customer Support.”)

Clearing the Failed State

The status bar on the front panel display shows a reverse video reminder (icon background reverses to black) of the drive or library fault that caused the log entry. You may clear this reminder by viewing either the **Library Hard Error Log** or **Drive Log** screens by selecting the center icon button on the Home screen.

The library’s reverse video reminder will also be set if the library’s *partial availability* status changes. (See “Partial Availability State” on page 4-8.) You can clear this reminder by viewing the **Library Status** screen.

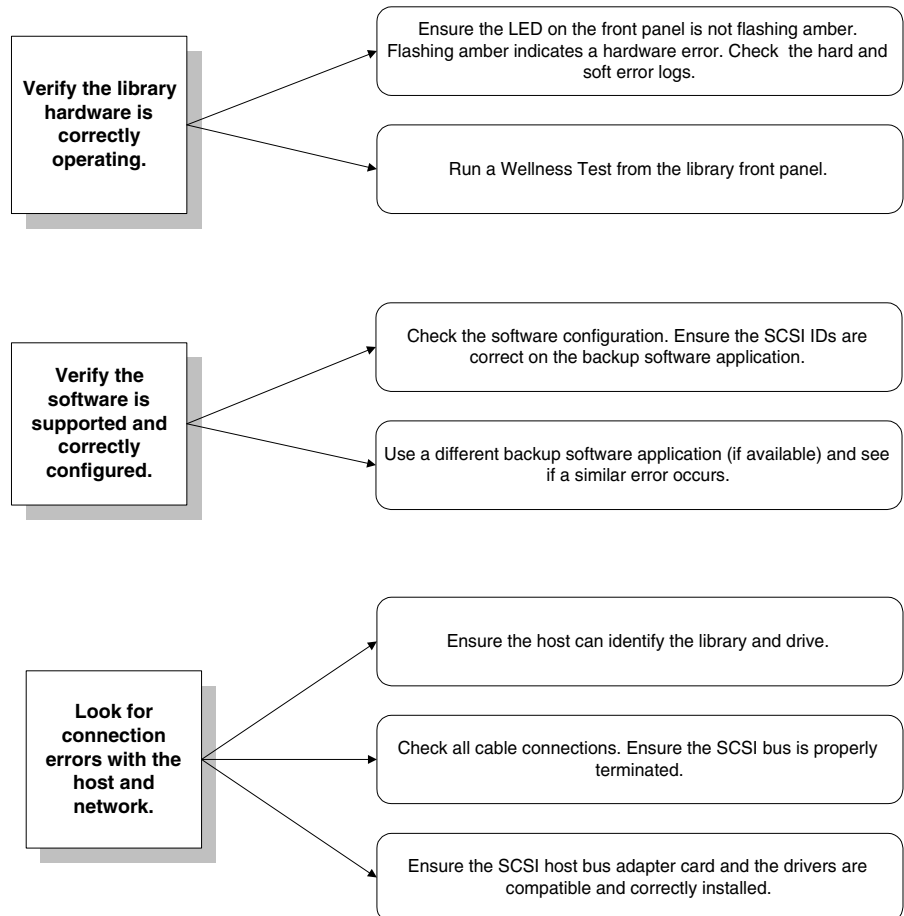
When the library records a hard error, the library status icon in the front panel display is set to **Failed**. This state can be cleared (to either **Healthy** or **Partly Available**) by one of the following:

- Running the **Recalibrate Library** test
- Power cycling the library

Host Software and Media Errors

The library depends on several other components to operate correctly. Errors that you believe are caused by the library often are a result of errors on the host, the network, or with the backup software. When troubleshooting the library, begin ruling out these components.

Use the following troubleshooting procedures to help determine if an error is caused by the library hardware, host, or backup software. Use the remote management card for troubleshooting media errors (see “Using the Remote Management Card” on page 3-9).



Understanding Error States

Backup Software Errors

While the library product itself is supported by Hewlett-Packard, all software products are supported by individual software vendors. (See “Backup Software Support” on page B-4.)

Your software applications may need to be reconfigured or, in some cases, reinstalled after you have installed additional drives or slots into the library. In addition, some backup software applications may require the purchase of additional add-on components and/or licenses when increasing the number of storage slots or drives.

Contact your software application provider for more information or if newly installed storage slots and drives are not recognized by your backup software application.

Interpreting Library LEDs

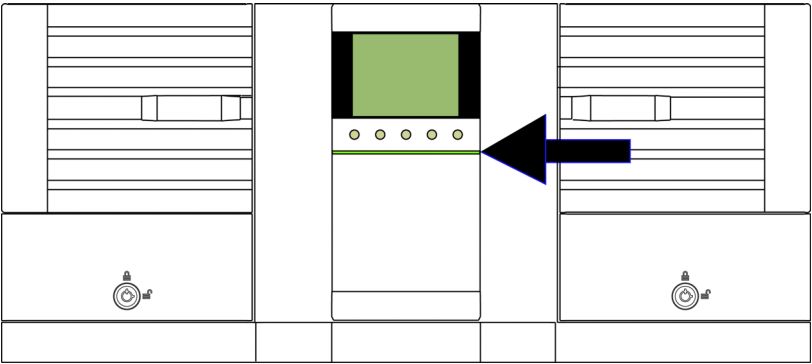
LEDs communicate status and errors as they are occurring. Use the library LEDs to determine the state of the library.

All library cards and drive modules contain LEDs. In general, a yellow LED comes on during power up and changes to green when power up is successful. This may take a few minutes on some library cards.

The LED bar underneath the front panel display indicates library activity.

Figure 4-2

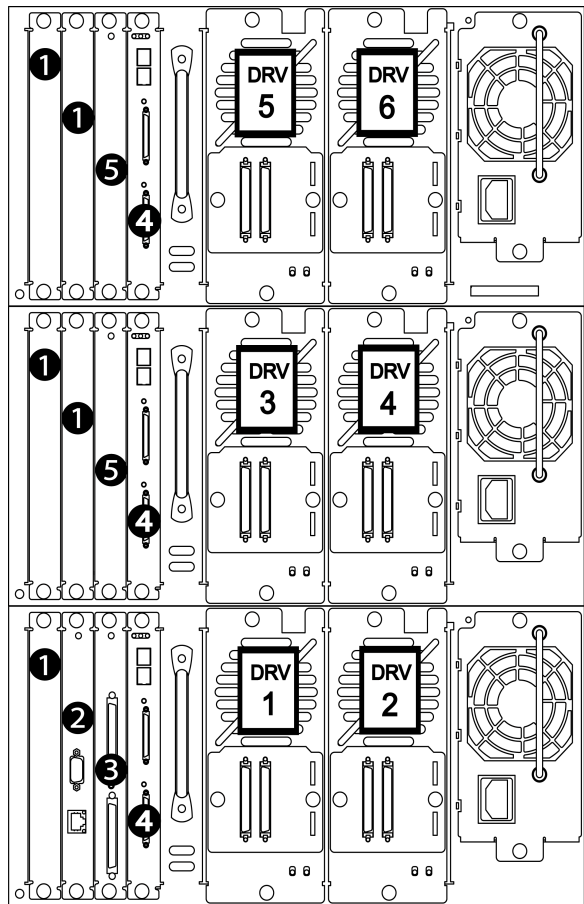
Front Panel LEDs



Green	Library is ready and idle.
Flashing Green	Library or drive is active.
Amber	Library is partially available and idle (see page 4-8).
Flashing Amber	Library failed (see page 4-13).

NOTE Figure 4-3 shows the back view of the library. Detailed LED illustrations follow.

Figure 4-3 Back View of the Library (60-Slot)



1	Vacant slot	4	Fibre Channel interface
2	Remote management card	5	Slave controller card
3	Library controller card		

Table 4-2 **Slave Controller LED**

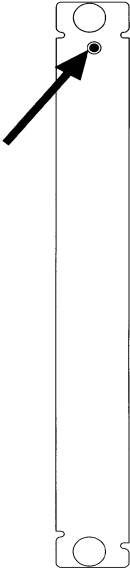
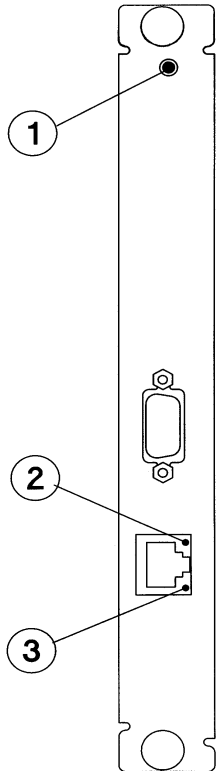
Ready LED		
Color	Description	
Yellow	Default boot mode on power-up. Will remain in this state until board completes initialization.	
Green	Slave controller board is ready.	

Table 4-3

Remote Management Card LEDs

1) Ready LED	
Color	Description
Yellow	Powering up, failed power-on test, or fatal error was detected during operation.
Green	Card passed power-on test. Card ready.
2) Link LED	
Color	Description
Green	Indicates valid network connection.
3) Activity LED	
Color	Description
Flashing Green	Indicates transmission activity by the card's ethernet port.

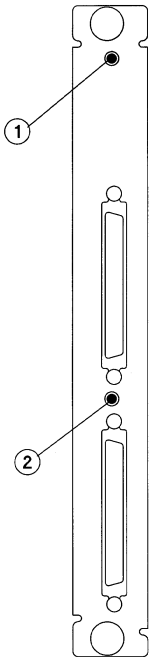


The diagram shows a vertical Remote Management Card with three LEDs indicated by numbered circles and leader lines:

- 1**: Points to the Ready LED, a small circular LED at the top of the card.
- 2**: Points to the Link LED, a rectangular LED located in the middle of the card, above the Ethernet port.
- 3**: Points to the Activity LED, a rectangular LED located at the bottom of the card, directly adjacent to the Ethernet port.

Table 4-4 HVDS Library Controller Card LEDs

1) Controller LED	
Color	Description
Flashing Green	Controller needs firmware.
Yellow	In the process of powering up.
Yellow flash	Controller failed power-on test.
Green	Ready.
2) SCSI LED	
Color	Description
Yellow	Error; single-ended SCSI device attached.

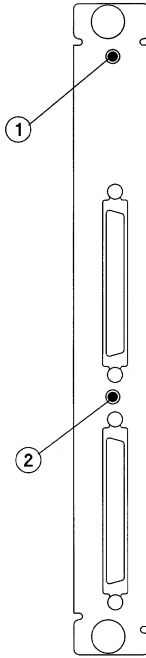


The diagram shows a vertical controller card with two LEDs. LED 1 is at the top, and LED 2 is further down. Both are indicated by numbered circles and leader lines.

Troubleshooting

Table 4-5 LVDS Library Controller Card LEDs

1) Controller LED	
Color	Description
Flashing Green	Controller needs firmware.
Yellow	In the process of powering up.
Yellow flash	Controller failed power-on test.
Green	Controller passed power-on test.
2) SCSI LED	
Color	Description
Green	No bus connected or low-voltage differential SCSI bus connected.
Flashing Green	Single-ended SCSI bus attached. SCSI performance reduced.
Yellow	High-voltage differential SCSI bus connected. Error.

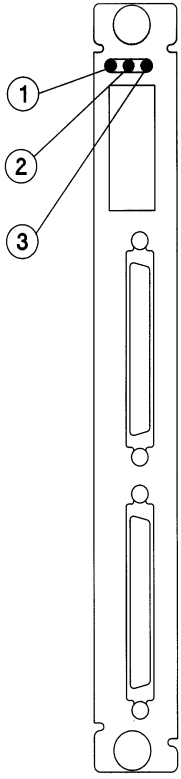


NOTE

Your Fibre Channel interface type (standard or high performance) is dependent on the drive technology in your library.

Table 4-6 Standard Performance Fibre Channel Interface LEDs

1) Activity LED	
Color	Description
Flashing Green	Indicates transmission activity by the Fibre Channel interface.
2) Link LED	
Color	Description
Green	Indicates valid Fibre Channel connection.
Yellow	Fibre Channel interface is being reset.
Off	Fibre Channel is not connected.
3) Ready LED	
Color	Description
Yellow	Fibre Channel interface is being reset, failed power-on test, or a fatal error was detected during operation.
Green	Fibre Channel interface passed power-on test. Interface is ready.
Flashing Green	One SCSI port is faulty.



The diagram shows a vertical Fibre Channel interface card. At the top, there are three small circular LEDs labeled 1, 2, and 3. LED 1 is the Activity LED, LED 2 is the Link LED, and LED 3 is the Ready LED. Below the LEDs, there are two larger rectangular components, likely ports or connectors, and a small circular component at the bottom.

NOTE Your Fibre Channel interface type (standard or high performance) is dependent on the drive technology in your library.

Table 4-7 High Performance Fibre Channel Interface LEDs

1) Activity LED	
Color	Description
Flashing Green	Indicates transmission activity by the Fibre Channel interface.
2) Link LED	
Color	Description
Green	Indicates valid Fibre Channel connection.
Yellow	Fibre Channel interface is being reset.
Off	Fibre Channel is not connected.
3) Ready LED	
Color	Description
Yellow	Fibre Channel interface is being reset, failed power-on test, or a fatal error was detected during operation.
Green	Fibre Channel interface passed power-on test. Interface is ready.
Flashing Green	One SCSI port is faulty.
4 & 5) SCSI Bus LEDs	
Color	Description
Green	SCSI bus is operational.
Yellow	SCSI bus is not operational, or is partially available.
Flashing Green	Indicates transmission activity by the SCSI bus.

Diagram illustrating the location of the LEDs on the front panel of the device. The panel is shown with five numbered callouts (1-5) pointing to specific LED locations:

- 1: Activity LED (top left)
- 2: Link LED (top right)
- 3: Ready LED (top right)
- 4: SCSI Bus LED (middle right)
- 5: SCSI Bus LED (bottom right)

Table 4-8 Drive Module LEDs

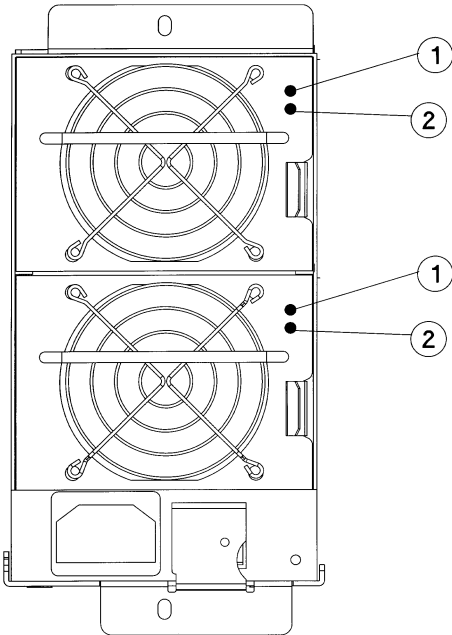
1) Yellow	2) Green	Description
Off	On	Drive is online and available.
Flashing	Off	Drive is offline and may be replaced.
On	Flashing	Drive is being brought online.
Flashing	On	Drive is offline. Internal communication has been lost.
On	On	Drive module controller is in reset.
On	Off	Power-on test in progress.
Flashes	Off	Drive module failed power-on test.

NOTE

Depending on your library's drive type(s), the back of the drive module might look different from the illustration above. For more information specific to your drive type, refer to Appendix D.

Table 4-9 **Redundant Power Supply LEDs**

1) AC Input LED	
Color	Description
Green	AC input is within the specified limit.
Off	AC input is outside of specified limit.
2) DC Output LED	
Color	Description
Green	DC output is within the specified limit.
Off	DC output is outside of specified limit.

A technical line drawing of a redundant power supply unit (PSU) with two fans. The unit is rectangular with a top and bottom fan section. Each fan section has a circular fan with a horizontal bar across it. To the right of each fan, there are two small black dots representing LEDs. Callout line 1 points to the top LED in the top fan section and the top LED in the bottom fan section. Callout line 2 points to the bottom LED in the top fan section and the bottom LED in the bottom fan section. The unit has mounting tabs on the top and bottom edges.

NOTE

The redundant power supply is an option for your library. If you do not have this option, your power supply will not have LEDs.

Troubleshooting Common Problems

This section includes information on troubleshooting common library problems. For problems that may be related to the host or application software, refer to the host system documentation, the application software instructions, and page 4-15. If these procedures fail, contact your service representative for further assistance.

CAUTION

Consult the system administrator before cycling power. Never cycle power when active devices are connected to the SCSI bus or Fibre Channel bus. Cycling power when the SCSI bus or Fibre Channel bus is active can cause data loss or hang the host system.

Table 4-10 Troubleshooting Table

Problem	Solution
Power	
Library will not power on.	• Check all power cord connections. • Make sure the power (standby) switch is on. • Make sure there is power to outlet. Try another working outlet. • Verify that the LEDs on the back of the library are on and that the fans are turning to ensure the library is receiving power (see page 4-17). • Replace the power cord(s). • Contact your service representative.
Power-on test failed. An error message appears in the front panel display.	• Follow the recovery procedures from the library front panel. • Note the error code and error code qualifier. • Contact your service representative.
One of the redundant power supplies is not functioning properly.	• Check the LEDs on the power supplies to identify the one that may be at fault (see page 4-26) and contact your service representative.

Table 4-10 Troubleshooting Table

Problem	Solution
The library's power failed while a tape was in the drive and did not return to the ready state after the power came on.	• Verify that the LEDs on the back of the library are on and the fans are turning (see page 4-17). • Power cycle the library • Contact your service representative.
No display messages appear.	• Make sure the power cord is connected. • Make sure the power switch is on. • Check that the LEDs on the back of the library are on and the fans are turning (see page 4-17). • Power cycle the library. • Try to access the library via the web (see page 3-9). • Contact your service representative.
Tape Movement	
An error message appears after inserting the magazine or loading tapes.	• Verify that tapes are inserted correctly in the magazine. (See page 2-13). • Verify that the correct tape type is used. (Refer to Appendix D.)
Tape stuck in drive.	• Power cycle the library and retry unloading the tape from the library front panel. • Ensure the backup host software is not reserving the slot. The backup software needs to cancel the reservation. • Refer to Appendix D for more information on removing a stuck tape. • Contact your service representative.
Tape stuck in transport.	• Run the Recalibrate Library test (see page 3-28). • Power cycle the library. • Contact your service representative.

Table 4-10 Troubleshooting Table

Problem	Solution
Tape stuck in storage slot.	• Using the front panel display, open the appropriate door. Slide the door outward and remove the magazine. • Pull the tape out. • Reinsert the magazine. • If the magazine is damaged, contact your service representative.
Transport is misaligned. Transport won't get a tape. Tape/drive/transport is misaligned.	• Run the Recalibrate Library test (see page 3-28). • Ensure that you are using the correct tape type. (Refer to Appendix D for more information.) • Contact your service representative.
Media	
Cleaning or data cartridge incompatible with drive.	• Ensure you are using cleaning and data cartridges that are compatible with the drive(s). (Refer to Appendix D for more information.)
Connections	
Changed drive SCSI ID, but the new ID is not recognized by the host computer.	• Check that all SCSI devices on the same bus have different ID numbers. • Reboot the host. • If the drive SCSI ID remains at 5, regardless of what is selected, then the drive is not communicating with the library. Contact your service representative.

Table 4-10 Troubleshooting Table

Problem	Solution
Host does not detect the library.	• Ensure that the HBA type matches the library type (HVDS, LVDS, or single-ended SCSI). • Check that the library is terminated and properly cabled. • Ensure that the terminator is compatible with the library (HVDS, LVDS, or single-ended SCSI). • Check that the library is recognized on the operating system (see page 1-40). • Check that the backup software is compatible with the library. • Check that the device is properly installed and configured using HP Library & Tape Tools available from www.hp.com/support/TapeTools. • Power cycle the library and power down the host. Wait until the library completes its power cycle before powering up the host. • Check for SCSI ID conflicts (see page 3-19). • If using Fibre Channel, make sure you power on the devices in the correct order (switch, hub, library, host). • Contact your service representative.
Network Monitoring	
The RMC Web-Based Library Administrator interface is slow in updating the web pages or does not display clearly.	• Check your computer's display settings. For best results, make sure the display resolution is set to 800 x 600 and the color palette is set to 65535 colors or higher. • To speed up the display of pages, be sure to bypass proxies for local access by listing the domains to exclude in the Connections/Advanced page of the browser options. • Check your browser's caching options to ensure the browser is looking for newer versions of the stored pages. (See page 3-12.)

Table 4-10 Troubleshooting Table

Problem	Solution
Cannot navigate through the RMC Web-Based Library Administrator interface.	Do not use the [Back] or [Forward] buttons on the browser to navigate. Instead, use the tabs and buttons on the actual interface page.
Library Performance	
HP-UX host responds slowly or crashes after connecting to the library.	- Check the SCSI IDs of all devices on the host buses to ensure there are no conflicts. - Check that the backup software does not require SCSI IDs to be in a certain order. - Contact your service representative.
The library is not efficiently backing up data.	- Check the network bandwidth from the host computer. - Check that the library's drive(s) are on their own SCSI bus and not daisy-chained to another tape drive or the hard drive. - Ensure that the drive is clean. See page 2-17 for more information on cleaning the drive. - Try a new tape. A marginal tape can cause performance problems due to bad spots on the tape requiring retries. - Ensure that the backup software is using fixed-length records (or blocks) to maximize throughput and has not defaulted to a smaller record size. - Ensure that the data is being compressed. - Check the size of the files. Small file size can impact performance.
Operations	
Cannot remember the administration menu password.	Contact your service representative.

Table 4-10 Troubleshooting Table

Problem	Solution
Need to abort internal test cycle.	Press [STOP]. The current test loop completes, then the test stops. It may take a few minutes to stop the current test loop.
Cannot write to the tape.	- Check the write-protect tab on the tape to assure write-enabled status. - Ensure that the backup software does not have the write-protect setting activated. - Check the host device file system access permissions. - Verify that you are using the correct tape type. (Refer to Appendix D for more information.) - Check the Drive Log and Media Log. - Try a new tape. CAUTION: <i>During the troubleshooting process, do not put the tape in question into another drive since damaged tapes can damage drives.</i>
Cleaning	
A new data cartridge is used and the <i>clean drive</i> icon is displayed.	- Ensure you are using an approved cleaning cartridge for your drive type. (Refer to Appendix D for more information.) - Clean the outside of the data cartridge using a damp cloth. - Clean the drive using the drive cleaning procedure on page 2-17. - If the icon is displayed again within a short amount of time, replace the data cartridge.

Table 4-10 Troubleshooting Table

Problem	Solution
Recurring cleaning message.	• Ensure you are using an approved cleaning cartridge for your drive type. (Refer to Appendix D for more information.) • Replace the existing cleaning cartridge with a new one. • If the message reappears when a particular data cartridge is used, verify that the data cartridge is readable by: — Clearing the error message. — Reading the tape again. • If the data cartridge can be read, backup data from the damaged cartridge to another cartridge, and discard the damaged one.
Cannot load the cleaning cartridge.	• Ensure you are using an approved cleaning cartridge for your drive type. (Refer to Appendix D for more information.) • Check the drive media log using the RMC Web-Based Library Administrator. • Contact your service representative.
Front Panel Display	
Front panel display does not work.	• Power cycle the library. • Attempt to access the library through the remote management card (see page 3-9). • Attempt to access the library from the host computer (either SCSI or Fibre Channel, depending on how the library is configured). • Contact your service representative.

Table 4-10 Troubleshooting Table

Problem	Solution
The soft keys on the front panel display do not work.	• Power cycle the library. • Attempt to access the library through the remote management card (see page 3-9). • Attempt to access the library from the host computer (either SCSI or Fibre Channel, depending on how the library is configured). • Contact your service representative.

Diagnostic Support Tools

The following external support tools are available for the library:

- HP Library & Tape Tools
- Support Tools Manager
- Sysdiag

HP Library & Tape Tools

With HP Library & Tape Tools installed on your host computer, you can do the following:

- Identify all SCSI and Fibre Channel devices connected to your system
- View detailed configuration, identification, inventory, and drive information for the library
- Easily update library and drive firmware (see page 4-60)
- Run advanced diagnostic tests, including connectivity, read/write, media validation, and testing library functionality
- View library and drive error logs
- Generate a detailed support file that can be emailed or faxed to your support representative for analysis

The HP Library & Tape Tools diagnostic provides an intuitive graphical user interface with integrated context-sensitive help. It can be downloaded free of charge from <http://www.hp.com/support/TapeTools>.

Support Tools Manager (STM)

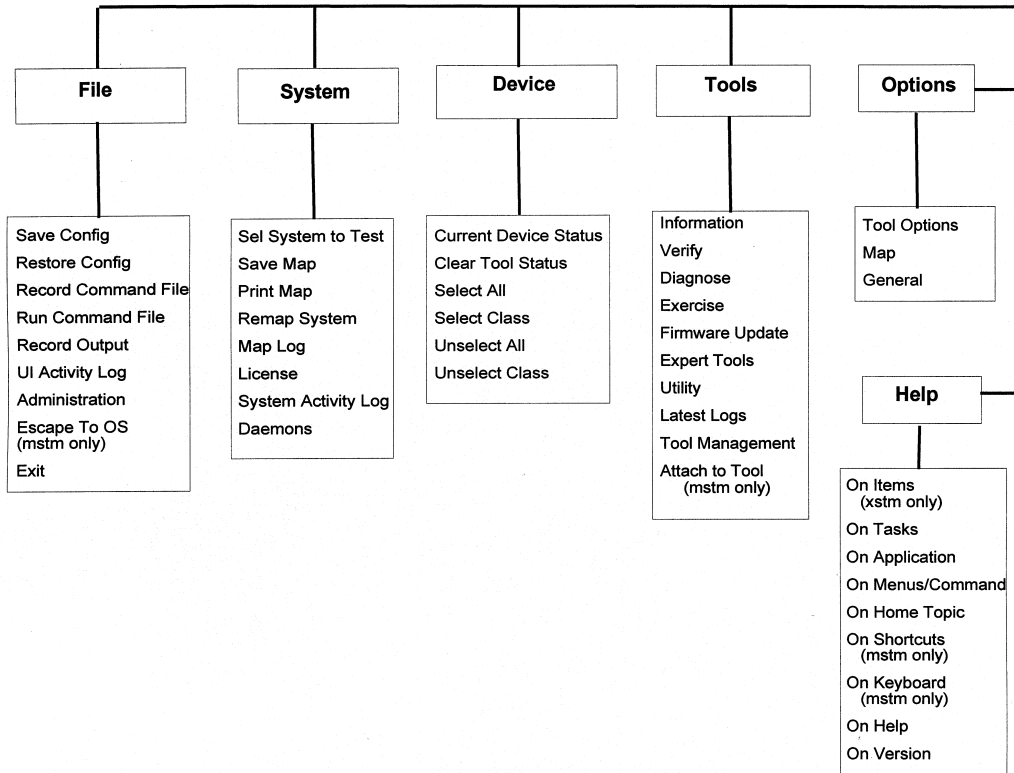
STM is the primary HP-UX support tool. Though this document provides general information about STM, more information is available through the following website:

- *<http://docs.hp.com/>*
Select **Systems Hardware, Diagnostics & Monitoring**.
Select **Online Diagnostics (STM)**.

There are three user interfaces, all in `/usr/sbin`:

- *xstm*: The X Windows interface
- *mstm*: The menu interface
- *cstm*: The command line interface

Overview of STM Menu Structure



Performing Operations

There are three basic operations in STM:

1. To select a device or devices:
 - In xstm, click on the device icon.
 - In mstm, move the cursor over the device, and press <SPACE>.

2. To run a tool:

```
Tools / <tool> / Run
```

3. To view logs after the tool completes:

```
Tools / <tool> / <log>
```

Using the STM Tools

- The Information tool creates an information log that contains firmware revisions and other useful device data. After the tool has created the log, you must then display it.

```
Tools / Information / Run
```

- The Verifier tool ensures the device is accessible by the operating system.

```
Tools / Verify / Run
```

- The Exerciser tool stresses the device.

```
Tools / Exercise / Run
```

- The Diagnostic tool attempts to isolate a hardware problem to a Field Replaceable Unit (FRU).

```
Tools / Diagnose / Run
```

- The Expert tool allows the user to interactively perform operations on the device.

```
Tools / Expert Tool / Run
```

- The Firmware Update tool allows the user to interactively download new firmware to the device.

Tools / Firmware Update / Run

- The Utilities tool is not tied to one device and includes:
 - Logtool Tools / Utility / Run... / logtool
 - Copyutil is used to copy disk data to another disk to replace a bad disk.

Tools / Utility / Run... / copyutil

- The Current Device Status tool provides general information about a device and what tools are available for it.

Select the device(s).

Device / Current Device Status

Reviewing Logs

STM saves detailed information in several logs:

- The Tool Activity Log contains testing details and errors for a specific tool on a device. Review this log when a tool does not complete successfully.
- Select device(s).

Tools / <tool> / Activity Log

- The Tool Failure Log contains hardware failure information. Review this log if a tool does not complete successfully.
- Select device(s).

Tools / <tool> / Failure Log

- The Information Log contains information gathered by information tools. Review this log after running an information tool.
- Select device(s).

Tools / Information / Information Log

Diagnostic Support Tools

- The System Activity Log contains error information that is logged by the diagmond daemon. Review this log if problems occur when initiating tools, viewing log files, connecting to a UUT, etc.

System / System Activity Log

NOTE

If the UI cannot connect to the UUT, use File / Administration / Local / UUT Logs / System Activity Log.

- The Map Log contains information and errors logged while scanning the system hardware. Review this log if the hardware map seems incorrect.

System / Map Log

NOTE

If the UI cannot connect to the UUT, use File / Administration / Local UUT Logs / Map Log.

- The UI Activity Log contains errors logged by the UI. Review this log when errors occur that prevent the UI from functioning correctly.

File / UI Activity Log

- The Diagnostic Daemon Log contains information logged by diagnostic daemons, such as memlogd and diaglogd. Review these logs if system or memory error logging does not seem to be functioning properly.

System / Daemons / Daemon Activity Log...

- The Syslog contains information and errors logged by a variety of HP-UX programs. Review this log if diagmond does not start up.

File / Administration / Local UUT Logs / syslog

- The OS Error Log contains information logged by I/O drivers and other operating system components. Review this log to check for hardware errors.

Tools / Utility /Run... / logtool

Types of STM Tools for Tape Libraries

Table 4-11 shows which types of STM tools are supported on the robotic and tape drive components of the library. *Not all commands are supported on all libraries.*

Table 4-11 Supported Tool Characteristics

Tool Type	Description	Supported For	
		Drives	Robotics
Information tools	Provides quick access to information about a device	X	X
Verifiers	Provides a quick verification that a device is properly connected and functional	X	
Exercisers	Stresses the hardware and assists in reproducing intermittent problems	X	
Diagnostics	Tests a device, and isolates a failure to the most likely FRU	X	X
Expert tools	Interactive tool that assists in troubleshooting	X	X
Firmware update tools	Interactive tool that updates the firmware	X	X

NOTE

Within STM, the robotics component of a library is represented with an icon or text identifier of *SCSI Media Changer*. The tape drive is represented with an icon or text identifier indicating the type of drive.

Expert Tools

Within an expert tool, select a category and command for the tool to execute:

- Drive tool (see below)
- Robotics controller tool (see page 4-44)
- Firmware update tool (see page 4-47)

Drive Tool

Table 4-12 lists expert tool categories and the specific commands that are applicable to tape drives.

Table 4-12 Drive Expert Tool Command

Category	Command	Effect
File	Save As	Save contents of menu window to a file.
	Print	Print contents of menu window.
	Exit	Exits the drive expert tool.
Logs	View Logs	Displays various drive log pages.
	Clear Logs	Clears various drive log pages.
	Pull Trace Logs (DDS only)	Displays trace logs.
Info	Describe or Drive Info	Displays general drive information.
	SCSI Inquiry Info (DLT only)	Displays SCSI inquiry page information
	Tape Info (DDS only)	Displays tape capacity information.
	System/Device Info (DLT only)	Displays drive log sense page information

Table 4-12 Drive Expert Tool Command

Category	Command	Effect
Tests	Test Unit Ready	Performs “Test Unit Ready” command on drive.
	Selftest	Executes the drive’s built-in diagnostic tests.
	Tape Validate	Reads a suspect tape until data ends or an error is detected.
	Write Test	Writes data to a tape, reads it back, and compares.
Utility	Tape Copy	Performs a tape-to-tape copy.
	Load Tape	Performs a load sequence.
	Unload Tape	Performs an unload sequence.
	Rewind	Rewinds to the beginning of a tape.
	Mode Sense	Displays user selected mode page data.
	Mode Select	Allows user to change selected mode select settings.
	Media Removal	Prevents or allows media removal.
	Data capture	Runs the “tape_capture -D -m” command and displays the results.
Options	Display Format	Displays data as either raw hex, decoded format text, or both.

Robotics Controller Tool

Table 4-13 lists expert tool categories and the specific commands applicable to the library robotics.

Table 4-13 Robotic Controller Expert Tool Command

Category	Command	Effect
File	Save As	Saves contents of menu window to a file.
	Print	Print contents of menu window.
	Exit	Exits the robotics expert tool.
Logs	View Logs	Displays various robotics log pages.
Info	SCSI Inquiry Info	Displays SCSI inquiry page information.
	Support Ticket	Displays robotics log sense page information.
	Read Element Status	Displays the status and inventory of robotics storage elements.
	Mode Sense	Displays user selected mode page data.

Table 4-13 Robotic Controller Expert Tool Command

Category	Command	Effect
Tests	Selftest	Performs power-on self test of robotics and reports results.
	Test Unit Ready	Performs “test unit ready” command on robotics.
	Wellness	Performs a wellness test of robotics and reports results.
	Exercise Mech	Performs an “exercise mech” diagnostic test and reports results.
	Empty Drives	Performs an “empty drives” diagnostic test and reports results.
	Fill Picker	Performs a “fill picker” diagnostic test and reports results.
	Empty Picker	Performs an “empty picker” diagnostic test and reports results.
	Vertical Encoder	Performs a “vertical encoder” diagnostic test and reports results.
	Random Moves I	<i>(May not be supported, depending on library model.)</i> Performs “random moves I” diagnostic test.
	Random Moves II	<i>(May not be supported, depending on library model.)</i> Performs “random moves II” diagnostic test.

Table 4-13 Robotic Controller Expert Tool Command

Category	Command	Effect
Utility	Rezero	Performs “rezero” command on robotics.
	Position to Element	Performs “position to element” command on robotics.
	Move Medium	Moves 1 tape cartridge in library.
	Exchange Medium	Moves 2 tape cartridges in library.
	Init Element Status	Performs “initialize element status” command on robotics.
	Set Drive Status	Changes on-line drive repair status of tape drives in library.
	Recalibrate	<i>(May not be supported, depending on library model.)</i> Performs a “recalibrate” diagnostic test and reports results.
	Data Capture	Runs the “tape_capture -D -m” command and displays the results.
	Set Serial Number	Changes the electronic serial number of robotics.
Options	Display Format	Displays data as either raw hex, decoded format text, or both.

Firmware Update Tool

When started, the firmware update tool will examine the firmware revision of the current SCSI device, and then search the directory `/var/tmp` for firmware files that are compatible with the device. The internal headers of any firmware files present in this directory will be checked. If compatible files are found, it will select the most current version and pop up a dialog box asking if you want to update firmware immediately. If you select **[Start Update]**, the tool will update the device firmware and display text messages indicating the status in the firmware update menu window.

If no files are found (or no compatible files are found), it will display an error message stating that no compatible files were found, followed by a dialog box prompting the user to change the directory path where the tool searches for firmware files.

If you have enabled the licensed firmware update tool, you can start it by selecting **[Utility]**, followed by **[Advanced Menu]** from the firmware update menu bar. A list of several compatible firmware files will be displayed in the dialog box that pops up. You can select from a list of files, and then select **[Start Update]** to begin the firmware update process.

NOTE

After updating firmware, allow time for the device to initialize and test itself. Power cycling the device before this process has completed may result in product failure and the inability to perform further updates.

Sysdiag

NOTE

Version 5.5 and 6.0 are supported for the libraries, but use the STM tool for version 6.5 (see “Support Tools Manager (STM)” on page 4-36).

Sysdiag is the MPE/iX support tool, and provides a consistent user interface for support of tape libraries, as well as many other types of peripheral devices.

Sysdiag is a licensed-use tool, so a user must first know and enter a diagnostics password. Enter a password by typing in the following command at the MPE/iX prompt:

```
:suplicen
```

Use of sysdiag also assumes knowledge of the ldevs at which the components to be supported are located. To start sysdiag, type in the following command at the MPE/iX prompt:

```
:sysdiag
```

This command will bring up the Diagnostic User Interface (DUI) prompt. Two diagnostics are available to support DLT libraries:

- SCSITAC (SCSI Tape Autochanger) for support of library robotics
- SCSIDLT for support of DLT tape drives

SCSITAC and SCSIDLT are divided into parts called “sections.” To use either of these diagnostics, enter the diagnostic name, ldev where the device is located, and section to be run at the UI prompt. For example:

```
DUI> scsitac ldev=6 sc=4
```

SCSITAC Sections

SCSITAC contains three sections:

- Section 1: Verification Trouble Tree
- Section 2: Hardware Trouble Tree
- Section 4: Interactive

Sections 1 and 2 perform tests on the library, report results, and return to the DUI prompt. Section 4 provides users with a SCSITAC prompt, which accepts the following commands (Table 4-14).

Table 4-14

SCSITAC Interactive Commands

Command	Function
devreset	Performs a SCSI device reset.
download	Downloads firmware. The user may place the download file anywhere on the host system. The download command will prompt the user to enter the fully qualified filename.
exit	Exits the interactive section.
inquiry	Performs a SCSI inquiry.
help	Displays this list of commands.
tur	Performs a SCSI Test Unit Ready.

SCSIDLT Sections

SCSIDLT contains four sections:

- Section 1: Verification Trouble Tree
- Section 2: Hardware Trouble Tree
- Section 3: Destructive Hardware Trouble Tree
- Section 4: Interactive

Sections 1, 2, and 3 perform tests on the library, report results, and return to the DUI prompt.

Section 4 provides the user with a SCSIDLT prompt, which will accept the following commands (Table 4-15).

Table 4-15 SCSIDLT Interactive Commands

Command	Function
blocklimit	Displays the maximum and minimum record lengths.
cartridge	Identifies tape type of loaded cartridge.
clearlogs	Clears error logs.
compression	Enables or disables compression.
devreset	Performs a SCSI device reset.
download	Downloads firmware. The user may place the download file anywhere on the host system. The download command will prompt the user to enter the fully qualified filename.
exit	Exits the interactive section.
inquiry	Performs a SCSI inquiry.
help	Displays this list of commands.
logs	Displays log pages.
motioncheck	Performs basic tape movement functions.
prevalow	Provides capability to prevent or allow tape removal.
rewind	Rewinds tape to BOT.
suspend	Suspends the current diagnostic process.
tur	Performs a SCSI Test Unit Ready.
workout	Performs a Write/Read test with data compression.

Removing and Replacing Cards (*for HP Authorized Personnel*)

CAUTION

This library contains very sensitive electrical components. It is important to follow the proper procedures to prevent electrostatic discharge (ESD). Use wrist-grounding straps and anti-static mats when removing and replacing cards and major assemblies.

Failure to follow proper procedures could lead to intermittent failures or premature hard failures.

CAUTION

The Fibre Channel printed circuit boards may contain a laser system (GBIC or GLM module) that is classified as a “Class-I Laser Product” under a U.S. Department of Health and Human Services (DHHS) Radiation Performance standard according to the Radiation Control for Health and Safety Act of 1968 and EN60825-1(+A11) safety of laser products. The compliance statement is located on the module.

Before powering the library off to remove a card, review the LEDs on the back of each card to ensure there is no activity (see “Interpreting Library LEDs” on page 4-17).

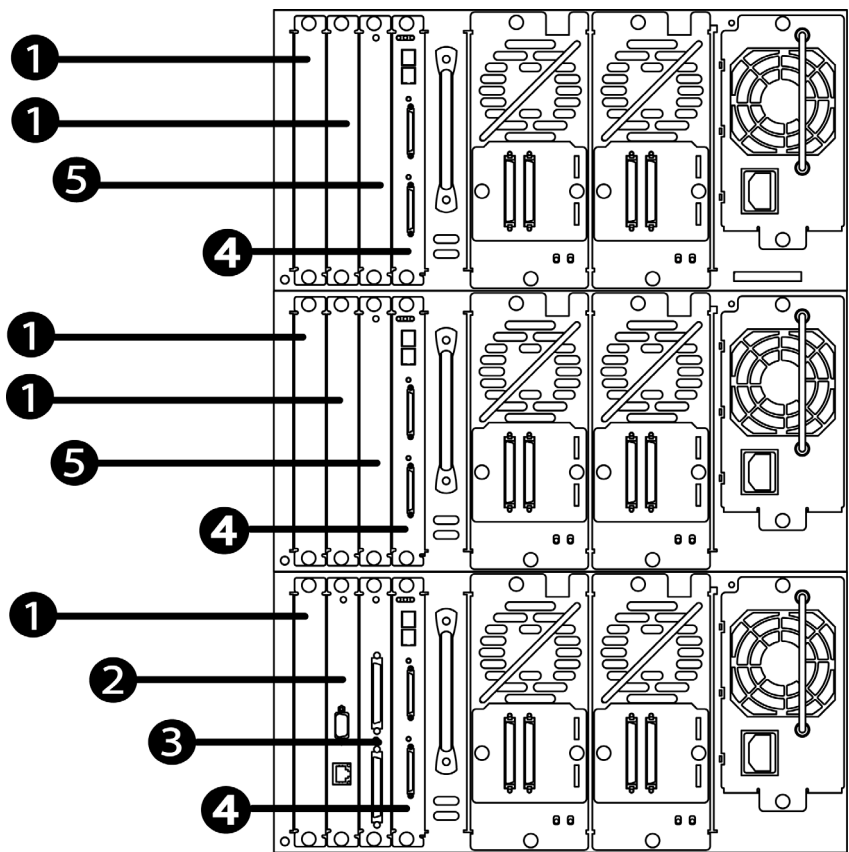
Removing a Card

1. Note the library configuration settings (if you will be downloading new firmware), and power off the library.
2. Note how the library is connected and the placement of the card, and then remove all external cables attached to the card.
3. Loosen the two thumbscrews on the card by hand or with a screwdriver.
4. Remove the card by gently pulling it outward.

Replacing a Card

1. Align the edges of the replacement card with the card slot.
2. Gently push the replacement card into the library until the card is flush with the library.
3. Tighten the thumbscrews (finger tight).
4. Reconnect external cables.
5. Power on the library.
6. Download new firmware (see “Upgrading Firmware” on page 4-60).
7. If installing Fibre Channel or remote management cards for the first time, configure the library from the front panel. See “Configuring the Library for Fibre Channel” on page 3-15 or “Using the Remote Management Card” on page 3-9.

Figure 4-4 Library Card Positions



1	Vacant slot
2	Remote management card
3	Library controller card
4	Fibre Channel interfaces
5	Slave controller card

Troubleshooting

Removing and Replacing Drive Modules (*for HP Authorized Personnel*)

This section explains how to replace a drive module in the following situations:

- **The library is not connected to the host.**

The host cannot access the library. The library can be powered on or off during drive replacement.

- **The library is connected to the host.**

The library is connected to the host, and the backup software can access the functional drives. Drives can be replaced without disabling or interrupting most functions of the library. This feature must be supported by the backup software.

Drive Replacement Overview

1. Determine which drive has failed (if you are replacing a failed drive).
2. Unload a tape from the drive, if possible.
3. Take the drive module offline (drive module only; the library does not need to be powered off).
4. Remove the drive module.
5. Insert and connect the new drive module.
6. Bring drive online.
7. Update drive firmware if needed. See “Upgrading Firmware” on page 4-60.

Unloading a Tape from a Drive

If a drive has failed or had an error, the following can happen:

- The icons on the library front panel indicate a drive error.
- The library attempts to take the drive offline.
- The host indicates an error and recommends taking the drive offline.
- The host automatically takes the drive offline (if supported).

Before replacing a drive, unload any tape from the drive (if applicable).

1. From the **Drive and Tape Operations** menu, select **Unload Tape from Drive**.
2. Use the [-] or [+] keys to select the drive you want to unload.
3. Select **[Unload]** to move the tape from the drive module to the original slot where the tape was located. The tape is automatically rewound before it is unloaded.
4. If you are unable to unload a tape from a failed drive, follow the procedure below.

Taking a Drive Offline

Although a drive module can be removed without powering off the library, *you must first take the drive module offline*. This process may be accomplished by using the library's front panel and following these steps:

1. Check the drive icons on the front panel display to see if the drive has already been taken offline. Verify the drive module's status by checking the LEDs on the back of the drive module (Table 4-8 on page 4-25).
2. If the drive module is not already offline, go to the **Administration** and then **Online Drive Repair** menus.
3. Select the drive with the [-] or [+] keys, and press **[OK]**.
4. Select **Put Drive Offline**. The front panel indicates the success or failure of this operation.

Removing a Drive Module

NOTE

To preserve SCSI communications, do not loosen or remove the SCSI cable(s) connected to the outside of the drive module. *The connection to be removed is located inside the drive module.*

When the drive module has been successfully taken offline, one of the LEDs on the back of the drive will be flashing yellow. Remove the drive module using the steps below:

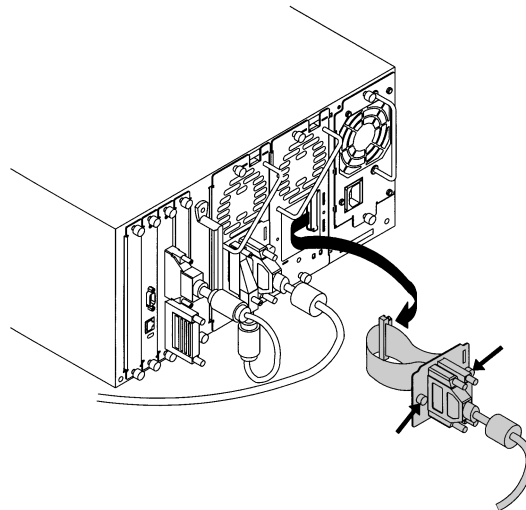
1. Verify the external SCSI cable is tightened to the connector plate.
2. Loosen the thumbscrews on each side of the connector plate, located in the middle of the drive module (Figure 4-5). If this is your first time loosening the thumbscrews, use a screwdriver.
3. Gently remove the connector plate, with SCSI cable(s) still connected.

CAUTION

Use standard precautions for electro-static discharge (ESD) protection.

4. Grasp the ribbon cable that is plugged into the drive module. Remove the cable by pulling the connector to the left. See Figure 4-5 for the location of the ribbon cable and connector.

Figure 4-5 Ribbon Cable and Connector



5. Lay the connector assembly to the side, allowing the external cables to hang from the connection(s). Do not disconnect external cables from the connector plate.
6. Loosen the top and bottom thumbscrews on the drive module (Figure 4-6).
7. Using the handle that is mounted on the back of the drive module, pull the drive module straight out with one hand while supporting the bottom of the drive module with the other hand.

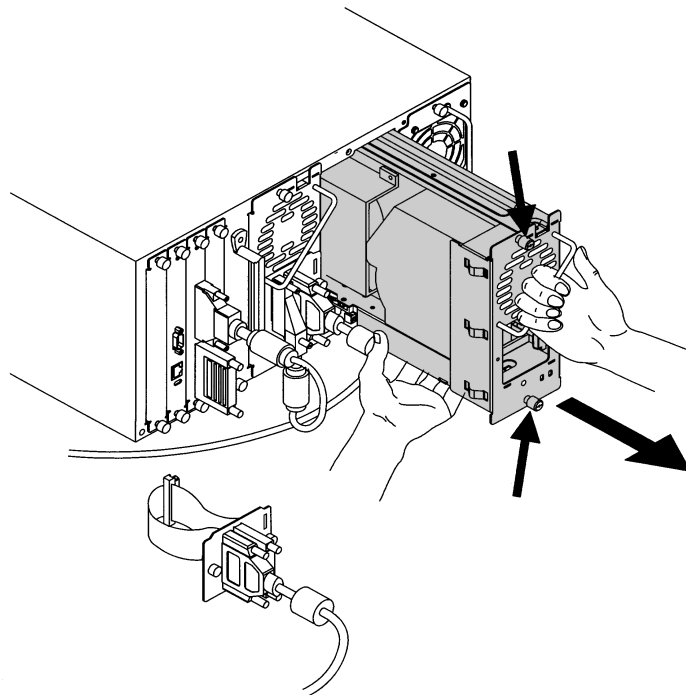
CAUTION

As the drive module is pulled out, support the bottom of the drive module to avoid dropping or damaging it.

WARNING

To avoid injury, do not insert your hand or foreign objects through the empty drive bay and into the vertical lift assembly area.

Figure 4-6 **Removing a Drive**



Installing a Drive Module

WARNING

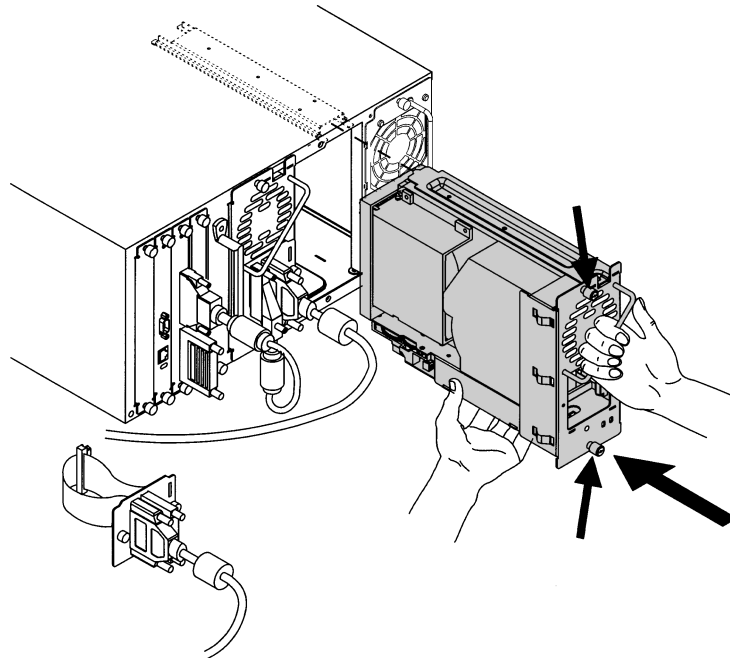
It is not necessary to power off the library when inserting a replacement drive module. However, to avoid injury, do not insert your hand or foreign objects through the empty drive bay and into the vertical lift assembly area.

1. Hold the drive module with one hand on the drive module handle while the other hand supports the bottom (Figure 4-7).
2. Install the drive by inserting the rail at the top of the drive module into the slot at the top of the drive module opening.

NOTE

Higher force will be required in the last half-inch of insertion to engage the electrical connection.

Figure 4-7 **Installing a Drive Module**



3. Tighten the top and bottom thumbscrews, securing the drive module into the library.
4. Plug the ribbon connector into the back of the drive module (Figure 4-5 on page 4-56).
5. Gently fold the ribbon cable (attached to the plate and SCSI cable), into the back of the drive module.
6. Holding the connector plate in place, tighten the thumbscrews on each side of the connector.
7. Bring the new drive module online using the front panel display.
 - a. Enter the **Administration** then the **Online Drive Repair** menus.
 - b. Select the drive module that has been replaced. Bring the drive back online.
 - c. If you have increased the number of drives since the last power cycle, you must power cycle the library for the library to recognize the additional drives.

The library will automatically run a self-test when the drive has been brought online. When the drive is successfully brought online, the new drive will adopt the SCSI ID of the current drive position.

NOTE

You may need to use the host backup software to recognize the new drive when bringing it online. If the software does not have the capability to automatically detect the new drive, you may need to reboot the host.

8. Update the drive firmware if needed. (See “Upgrading Firmware” on page 4-60.)

NOTE

You may get a drive firmware mismatch error if you have multiple drives with different firmware revisions. See Table 4-1, “Partial Availability Conditions,” on page 4-9.

Upgrading Firmware

This section details the processes for upgrading library and drive firmware. Some of the processes used for upgrading library firmware are different from those used to upgrade drive firmware.

Firmware can be downloaded by:

- Using the remote management card (*library only*)
- Using a host diagnostic utility (*library and drive*)
 - Using HP Library & Tape Tools (*Windows only*)
 - Using the Support Tools Manager (*HP-UX and MPE/iX only*)
- Using a firmware upgrade tape (*drive only*)

NOTE

After upgrading firmware, library configuration settings will revert back to the factory defaults, which could affect remote management. For a complete list, see Table 3-2, “Default Configuration Settings,” on page 3-4.

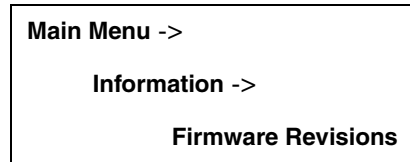
Checking the Firmware Revision

Before downloading new firmware, check your current firmware revisions, and compare them to the latest available revisions at www.hp.com/go/support.

NOTE

If the library is in a partial availability state due to a firmware mismatch, new firmware must be downloaded to resolve the condition. (See “Partial Availability State” on page 4-8.)

1. Ensure the library is powered on.
2. Use the following menu from the front panel:



3. From the **Firmware Revisions** menu, use **[More]** to view the drive firmware revisions.

You can also check your current firmware revisions via the remote management card:

1. Enter the designated IP address into the web browser to launch the Web-Based Library Administrator pages. (See “Using the Remote Management Card” on page 3-9.)
2. Select the **[Report]** tab.
3. Scroll down to the **Firmware Revisions** section of the page to view your library and drive firmware revisions.

NOTE

Ensure that your backup software does not “SCSI reserve” the library, as this can prevent a firmware download.

Using the Remote Management Card *(library firmware only)*

All library components, except drives, can be easily downloaded from the remote management card (“Using the Remote Management Card” on page 3-9).

NOTE

The firmware file is available from HP Support at www.hp.com/go/support. These files must be loaded onto the local host computer before downloading firmware. First select your product, and then make a selection from the **Downloads & Drivers** pull-down menu.

1. Once the library is configured for network access, enter the IP address within your web browser to launch the Web-Based Library Administrator pages. (See “Using the Remote Management Card” on page 3-9.)
2. Select the **[Configuration]** tab from the main screen.
3. Select the **[Firmware Download]** button.
4. Enter the full pathname for the download file, or use the **[Browse]** button to locate the file.

NOTE

The library administrator password is required for this process and is not set by default. If the password is not set, you will not be permitted to download firmware. (See “Enabling and Changing the Password” on page 3-5.)

5. Select the **[Start Firmware Download]** button to begin the actual process of downloading the library firmware.

Once the download process begins, the progress and status of the download will display on the lower half of your screen.

NOTE

The firmware download may take several minutes to complete.

Using a Host Diagnostic Utility (*drive and library firmware*)

You can download library and drive firmware using a host-based diagnostic utility. These utilities may already be installed on your host. If not, you can access them from HP Support at www.hp.com/go/support. First select your product, and then select **Downloads & Drivers**.

Using HP Library & Tape Tools (Windows only)

Online help and instructions are included with HP Library & Tape Tools. The firmware download procedure involves these simple steps:

1. Run the HP Library & Tape Tools utility.
2. If prompted to download new firmware from the website, select **Yes**, otherwise, select **Get Firmware from Web** under the **File** menu.
3. Select the firmware revisions for the library and drive that you would like to download firmware to, and then select **Download**. The firmware file(s) will be copied into the firmware folder of the HP Library & Tape Tools utility.
4. Select the library in the **By Product** device list, and then select the **Firmware** tool. The latest revisions available for the library and drive will automatically be selected.
5. Select **Start Update** to update the firmware for the library and/or drive.

Using Support Tools Manager (HP-UX and MPE/iX only)

The Firmware Update Tool within Support Tools Manager allows you to download firmware directly from the host. For more information on this tool, see “Support Tools Manager (STM)” on page 4-36 or visit HP Support at www.hp.com/go/support. Select the **Downloads & Drivers** link for your model.

Using a Firmware Upgrade Tape *(drive firmware only)*

1. Contact your service representative to get the drive upgrade tape.
2. Ensure that the drive is online (green LED is on, and yellow LED is off). If not, place it online through the front panel. The library will automatically run a self-test when the drive has been brought online.
 - a. Enter the **Administration** then the **Online Drive Repair** menus.
 - b. Select the drive module and press **[OK]**.
 - c. Select **Put Drive Online**.
3. Ensure the drive is empty. The drive icon(s) on the Home screen indicates the presence of a tape in the drive. If a tape is in the drive, use the front panel display to return the tape to a storage slot. (See page 2-17.)
4. Place the firmware upgrade tape in an available storage slot in the library, and note the slot number.
5. Use the following menu to perform the firmware upgrade:

Main Menu ->

Administration ->

Upgrade Drive Firmware

6. From the **Upgrade Drive Firmware** menu, use the **[-]** or **[+]** key to select the slot containing the firmware upgrade tape. Select **[OK]**.
7. Use the **[-]** or **[+]** key to select the drive that you want to upgrade. Select **[OK]**.
8. Watch the upgrade status on the library's front panel. Only drives that are online and empty (not reserved) can be upgraded.

NOTE

When the operation is complete, the tape will be returned to its original slot.

9. Remove the firmware upgrade tape from the library.

A Technical Specifications

Appendix Overview

- Environmental Specifications
- Library Specifications
- Cable Specifications

NOTE

For drive, media, and bar code specifications, refer to Appendix D, “Drives and Media.”

Environmental Specifications

Table A-1 Environmental Specifications

Characteristic	Specification
Temperature/Humidity	
Operating	10° to 35° C
Non-operating	-35° to 65° C
Operating wet-bulb temperature (media)	25° C maximum
Non-operating wet-bulb temperature (drive)	46° C maximum
Gradient	10° C per hour
Transportation	-30 to 60° C (<14 consecutive days)
Humidity	
Operating	20% to 80% RH non-condensing
Non-operating	10% to 90% RH non-condensing
Shock	
Operating	4.0g (half-sine)
Non-operating	10g/24ips
Vibration (5-500 Hz)	
Operating	0.21g RMS (random)
Non-operating	2.1g RMS (random)
Operating	0.25g (0-peak, swept-sine)
Non-operating	0.5g (0-peak, swept-sine)

Technical Specifications

Library Specifications

Table A-2 **Library Specifications**

Description	20-Slot	40-Slot	60-Slot
Average tape access time	15 seconds	15 seconds	15 seconds
Average tape exchange time (mean time to eject tape from drive, robotically exchange tape from magazine and reload drive)	46 seconds	46 seconds	46 seconds
Storage capacity	Dependent upon the model and configuration		
MTBF	100,000 Hours (robotics only) 50,000 Hours (including drives)	100,000 Hours (robotics only) 50,000 Hours (including drives)	100,000 Hours (robotics only) 50,000 Hours (including drives)
MSBF (robotics)	1,000,000 swaps (robotics)	1,000,000 swaps (robotics)	1,000,000 swaps (robotics)
Line voltage	100-127/200-240 VAC Auto- selecting	100-127/200-240 VAC Auto- selecting	100-127/200-240 VAC Auto- selecting
Line frequency	50-60 HZ	50-60 HZ	50-60 HZ
Power consumption	Typical: 175W, Max: 200W	Typical: 340W Max: 375W	Typical: 500W Max: 560W

Physical Specifications

Table A-3 Physical Specifications of the Libraries

Description	Library
Height	
20-Slot	216 mm (8.5 inches)
40-Slot	489 mm (19.25 inches)
60-Slot	711 mm (28 inches)
Width (all)	44.2 cm (17.4 inches)
Depth (all)	696 mm (27.4 inches)
Weight (net)	
20-Slot	40.9 kg (90 lbs) with drives and without media
40-Slot	76.4 kg (165 lbs) with drives and without media
60-Slot	104.1 kg (229 lbs) with drives and without media
Weight (packaged)	
20-Slot	53.1 kg (117 lbs)
40-Slot	81.7 kg (180 lbs)
60-Slot	110.7 kg (244 lbs)
SCSI Interface	68-pin, high-density, low- or high-voltage differential connector
Fibre Channel Interface	• Shortwave optical Gigabit serial interface utilizing a GBIC or built-in optical connection • Dual high density or VHDCI low- or high-voltage differential SCSI ports • Industry-standard Tachyon™ controller or TL controller

Technical Specifications

Cable Specifications

Table A-4 **SCSI Cable Specifications**

Interface	Maximum supported length	
	Fast SCSI <i>10 MB/second Narrow</i> <i>20 MB/second Wide</i>	Normal/Slow SCSI <i>5 MB/second Narrow</i> <i>10 MB/second Wide</i>
Single-Ended	3 meters	6 meters
Low-Voltage Differential	12 meters	12 meters
High-Voltage Differential	25 meters	25 meters

NOTE Ensure that all cables conform to the ANSI SCSI specifications.

Table A-5 **Fibre Channel Cable Specifications**

Cable	Maximum supported length
50/125 fibre-optic cable	500 meters
62.5/125 fibre-optic cable	175 meters

Drive, Media, and Bar Code Specifications

For drive, media, and bar code specifications, refer to Appendix D, “Drives and Media.”

Technical Specifications
Drive, Media, and Bar Code Specifications

B Customer Support

Registering Your Product

Registering your product ensures fast and easy access to Hewlett-Packard Customer Support. There are three ways to register.

- On our web site:
http://www.hp.com/support/tape_libraries
- By fax:
U.S. 1-877-840-3638 (Toll Free)
International 970-350-5121
- Pre-paid mail:
Mail the registration card attached to this manual

HP customers who register on our web site join a select group who register to receive:

- Technical support updates
- Special Hewlett-Packard offers
- Direct-to-you details on:
 - Ideas and ways to use your new HP SureStore Tape Library
 - Other exciting HP products
 - News on emerging technologies

Service Contracts

Service contracts are also available for your library. If you choose to purchase one, your warranty will be upgraded. Table B-1 lists available service contracts and response level upgrades for 20-Slot, 40-Slot, and 60-Slot HP SureStore E Tape Libraries.

Table B-1

Hardware Service Contracts

Option	Description
O2A	On-site 4 hour same day response, Monday - Friday, business hours (vary by country).
02C	On-site next day response, Monday - Friday, business hours (vary by country).
02G	On-site 4 hour same day response, 7 days a week, 24 hours a day.
02V	On-site 6 hour call-to-repair, 7 days a week, 24 hours a day.
02X	Onsite 4 hour call-to-restoration, 7 days a week, 24 hours a day.
Response Level Upgrades	
07A	Upgrades warranty response to the 02A response level.
07G	Upgrades warranty response to the 02G response level.
07V	Upgrades warranty response to the 02V response level.
07X	Upgrades warranty response to the 02X response level.

NOTE

For more information on service contracts, visit www.hp.com/go/support. Choose your product and select **Warranty Information**.

Backup Software Support

While the library product itself is supported by Hewlett-Packard, all software products are supported by individual software vendors. When contacting the software vendor for support, you will need the following information:

- Your name and telephone number
- Product name, release number, operating system, build, and serial number
- Detailed list of error messages reported
- Configuration files and log files related to the problem
- Screen dumps, if applicable
- Explanation of how to reproduce the problem, if possible
- Events that may have contributed to the problem, recent operator actions, recent events in the software or the system, and recent changes to the computer system, software, or network environment.

Supplies and Accessories

A full range of supplies may be ordered through a Hewlett-Packard authorized dealer or sales office, or by contacting HP Direct.

- Call 1-800-752-0900 for the location of the nearest authorized Hewlett-Packard dealer.
- To phone HP Direct, call 1-800-538-8787 or write to HP Direct at the following address:

HP Direct
Hewlett-Packard
ATTN: Mail Order
P.O. Box 1145
Roseville, CA 95678

- Visit the Customer Care website at www.hp.com/go/support.

Information Needed for Support

Before contacting your support representative, please have the following information ready:

- Model number of your library
- Serial number (see “Library Information” on page 3-23)
- Drive type(s)
- Error codes and error code qualifiers
- Revision number for library and drive firmware
- Brand and model of your host computer
- Brand and model of your SCSI or fibre channel host adapter
- Library drivers and backup application software that you are using and the version number(s)

Customer Support
Information Needed for Support

C Introduction to Fibre Channel

Chapter Overview

This section contains information about the following:

- **Fibre Channel Terminology:** Contains basic terms that you should know before connecting the library to Fibre Channel topology.
- **Fibre Channel with Libraries:** Contains general information about host prerequisites. (See “Fibre Channel Cable Connections” on page 1-33 for more information about installation and configuration.)
- **Fibre Channel Technology:** Contains general information about Fibre Channel technology.

CAUTION

The Fibre Channel printed circuit boards may contain a laser system (GBIC or GLM module) that is classified as a “Class-I Laser Product” under a U.S. Department of Health and Human Services (DHHS) Radiation Performance standard according to the Radiation Control for Health and Safety Act of 1968 and EN60825-1(+A11) safety of laser products. The compliance statement is located on the module.

To ensure proper use of this product, read this instruction manual carefully and retain for future reference.

Fibre Channel Terminology

AL_PA:	Arbitrated Loop Physical Address.
Auto-select addressing:	Default addressing assignment method for libraries that picks an available address and uses it as the hard address from then on.
Fabric:	Switched interconnect methodology that supports high-speed data routing in Fibre Channel networks.
Fibre Channel:	A transport protocol that allows high-speed communication among workstations, super-computers, mainframes, data storage devices, and other peripherals. Fibre Channel is capable of transmitting and receiving data simultaneously.
Fibre Channel Arbitrated Loop (FC-AL):	Topology that provides a low-cost solution for attaching multiple Fibre Channel ports in a loop without switches.
Hard addressing:	Addressing assignment method that allows you to set and maintain a fixed address.
Hub:	A device that provides a multiple port loop interconnect system to implement a FC-AL using a physical “star” configuration.
Point to Point:	Fibre Channel topology in which two Fibre Channel devices are connected together.
Protocol:	A data transmission convention that encompasses timing, control formatting, and data representation.
Soft addressing:	Addressing mode that looks for an unused address during every power cycle.
Switch:	A device that provides a (n by n) interconnect to allow a port to have full communication bandwidth with any other port while other communications are occurring.
Topology:	The logical arrangement of nodes on a network.

Introduction to Fibre Channel
Fibre Channel Terminology

Zoning: A management method used to control, or limit, port connections.

Fibre Channel with Libraries

NOTE

See “Fibre Channel Cable Connections” on page 1-33 for more information about installation and configuration.

The Fibre Channel interfaces in the 20-slot, 40-slot, and 60-slot libraries serve as a bridge between SCSI and Fibre Channel by supporting the following:

- Two actively terminated, 68-pin, fast and wide, HVD or LVD SCSI ports that support SCSI sequential access and medium changer target devices
- FC-PLDA (Fibre Channel - Private Loop Direct Attach) ANSI standard
- Single 1.0625 Gigabit per second Fibre Channel port
- Fibre Channel Arbitrated Loop (FC-AL) and switch fabric (FC-SW) topologies
- Class 3 connection using SCSI-FCP protocol

NOTE

Libraries that do not have Fibre Channel interfaces only support the SCSI protocol.

Host Prerequisites

To use Fibre Channel, check the host for the following:

- Fibre Channel backup software, host interface adapters, and associated device drivers.
- Host that acts as an initiator using the Fibre Channel interface to communicate with Fibre Channel SCSI target devices.
- Backup software with robust error recovery. Fibre Channel is an open system, similar to LAN. Consequently, Fibre Channel is subject to data flow interruptions from power cycling, connections, disconnections, and ESD discharges.

Fibre Channel Technology

Overview of Fibre Technology

NOTE

This section provides an overview of Fibre Channel technology. You can find information specific to the 20-slot, 40-slot, and 60-slot libraries in “Fibre Channel with Libraries” on page C-5 and “Fibre Channel Cable Connections” on page 1-33.

Fibre Channel is an industry-standard interface that is used to transfer information between computers and computer sub-systems. Defined by the American National Standards Institute (ANSI), Fibre Channel supports the following:

- Internet Protocol (IP)
- Small Computer Systems Interface (SCSI)
- High-Performance Parallel Interface (HIPPI)
- Other high-level protocols

With Fibre Channel, these protocols can be run at the same time. For example, a host bus adapter (HBA) can simultaneously send Local Area Network (LAN) information to another computer via IP while reading and writing data to a (RAID) subsystem via SCSI. In addition to supporting multiple protocols at the same time, Fibre Channel offers the following advantages:

- High speed data transmission
- Long distance support (up to 10 kilometers)
- Large address space
- Multiple device configurations

Connection Topologies

Fibre Channel uses three connection topologies, which are described in the table below.

Table C-1

Fibre Channel Topologies

Topology	Description	Advantages/ Disadvantages
Point to point	Two devices connected directly together.	• Low cost, high performance. • Limited topology (only allows two devices).
Fibre Channel Arbitrated Loop (FC-AL)	Connects up to 127 devices through one or more Fibre Channel hubs. Loops can be private or public. Private loops are not connected to a fabric. Public loops are connected to a fabric.	• Supports more devices than point-to-point. • Limits the combined data transfer rate to 100 MBps.
Fabric (FC-SW)	Supports up to 16 million devices connected through a series of fabric switches, similar to an Ethernet network.	• Supports multiple devices without limiting performance. • High cost per port.

Addressing

Device Addresses on a Fibre Channel Loop

Each device on a Fibre Channel Arbitrated Loop (FC-AL) has a unique address known as the Arbitrated Loop Physical Address (AL_PA). There are 126 valid AL_PAs that correspond to the 127 devices allowed on a Fibre Channel loop with values between 0-255 (not all values are valid).

The “address index” also represents the device’s address. Address indexes are used on devices where external switch settings determine the AL_PA. Each number between 0-126 corresponds to one physical address.

Address Assignments

Soft addressing and hard addressing are used to assign a unique AL_PA to each device. A device using soft addressing will take the first available AL_PA as its own. If the device is later power-cycled, it might select a different AL_PA. Although soft addressing has an easy loop setup, many host systems (including HP-UX™ and Windows NT™) lack the ability to track such dynamic address changes.

Hard addressing solves the problem of dynamically changing AL_PAs, but requires more user intervention to set up. The user must select an AL_PA for each device. When the device is connected to a loop, the device will attempt to use the user-specified AL_PA. If the device is later power-cycled, it will attempt to use the same AL_PA. This results in more stable addressing over time.

Address Conflicts

When all devices use soft addressing, address conflicts will not occur. However, if more than 127 devices are connected to the same loop, those extra devices will fall into a non-participating state in which they cannot communicate without reconfiguring the loop.

When using hard addressing, address conflicts may occur if more than one device is trying to use the same AL_PA. When this occurs, one device will take the specified AL_PA. The other will either take the first available AL_PA or fall into a non-participating state, depending on the hardware.

Ports, Nodes, and World Wide Names

All Fibre Channel devices have globally unique identifiers called World Wide Names (WWN) that are assigned by the manufacturer and registered under IEEE. Fibre Channel devices are split into ports (connection points) and nodes (sources and destinations of transmitted data). All ports and nodes of a device will have unique WWNs that are used to validate AL_PAs. The user cannot configure the WWN, but the WWN can be used to track devices on a loop.

Fibre Channel Loop State

Loop state reports the status of the Fibre Channel loop from a device's point of view. A loop up condition indicates that the Fibre Channel device obtained an AL_PA on the loop and is ready to send and receive data. A loop down condition indicates that the device did not successfully connect to the loop. Fibre Channel devices will continuously try to re-establish a connection to the loop. The user may use the management facilities of a hub, switch, or HBA to help identify the cause of a loop down condition.

If a loop down condition occurs, it is likely that device operations have been disrupted or aborted. Some host applications may not be able to automatically recover from this state. Also, some hubs and switches have the ability to add or remove devices to prevent disruptions.

Hubs and Switches

Hubs and switches are used to create different Fibre Channel topologies. Hubs create arbitrated loops, and switches create fabrics. The external physical cable configuration is the same for both hubs and switches. Both use a physical star configuration, with one device at the end of each leg of the star. Hubs and switches differ in the way that their ports are connected to other ports internally. Hub connections are less complex than switch connections, and, as a result, hubs are less expensive to design and build. Switches, however, provide higher performance and connectivity.

Fibre Channel ports on a hub are connected together in a serial fashion, with the output of one port connected to the input of the next, creating a loop. Each Fibre Channel device is connected to a single port on the hub in order to make a connection to the loop. To make larger loops, ports on a hub can be connected to ports on other hubs. Because all ports on a hub are connected in a loop, when hubs are connected together, all ports on

the combined hubs still form one loop. This is called cascading hubs. (See “Zoning” on page C-12 for dividing Fibre Channel topologies within the same physical configuration.) Some hubs do not work with more than a certain number of hubs cascaded in a series. Typically, the maximum number of hubs between any two devices is three, due to a lack of good signal regeneration. If too many hubs are cascaded, the Fibre Channel signal degrades to the point where data is not being transferred reliably.

In addition to physically creating a loop with its ports, hubs also provide isolation for failed or disconnected ports. Hubs allow loops to be created without requiring that all ports are connected and all devices are turned on. Hubs also allow loops to be created using more than one type of connection media. For example, all Fibre Channel devices within buildings can use a short wave optical connection, and a long wave connection can be used between buildings. The disadvantage of hubs is in the area of performance. Only two devices on an arbitrated loop can communicate at the same time. As a result, the maximum average throughput to any one device is a fraction of the total bandwidth of the loop.

Some of the advantages of hubs also apply to switches. Switches can connect up different devices using more than one type of connection media. In addition, switches allow a system to function with one or more ports, disconnected or turned off. Unlike hubs, switches (and the fabric in general) allow all devices access to the full bandwidth of the Fibre Channel system. Adding devices to a properly designed fabric does not affect the performance of the fabric in any way. Unfortunately, switches are more complex and costly than hubs. With hubs, a port is connected to the next port, forming a loop. With switches, a port is connected in a logical, or physical, crossbar to all other ports on the switch. As a result, all ports on a switch can connect to all other ports on a switch without any intervening ports. Switches also regenerate the data signal, which prevents cascading issues. Interconnecting switches is more complex than for hubs. With hubs, there is only one connection in between any two hubs. With switches, there are multiple connections needed in order to maintain the full bandwidth of the fabric. As with hubs, switches can have “zones” of allowed connections. (See “Zoning” on page C-12.)

NOTE

HP Fibre Channel libraries are designed to work with both hubs and switches equally, allowing you to use the topology that best meets your needs.

Zoning

Zoning is a management method used to control which ports on a hub, or switch, can communicate with each other. Zoned operations are controlled by system administrators and host computer applications. The HP SureStore E Tape Library functions the same on zoned and non-zoned systems.

With a hub, zoning divides a larger loop into multiple smaller, independent loops. With a switch, zoning limits which ports can be accessed. Reasons a system administrator, or an application program, would want to limit access include providing security for computer systems, and restricting computer systems access to disk drives with sensitive data.

Zoning also allows different computer systems to coexist on the same network. For example, NT devices connected to NT computers can coexist with Unix devices connected to Unix computers. With fabrics, some ports can be shared across zones. As a common port, a tape library could backup both NT and Unix systems. However, this is not possible with loops, due to the nature of how the arbitrated loop protocol functions.

Some advantages of zoning include:

- Disturbances outside of the zone do not affect devices within the zone.
- When backing up to a tape drive, an application will not lose communication with the tape drive when other ports on the system outside of the zone are turned on or off.
- Zoning can be done dynamically, allowing an application to select only the devices for communication, which increases the reliability of the overall system.

NOTE

Not all systems and subsystems support zoning. Use of this feature is limited to architectures designed for it. HP Fibre Channel libraries do not need additional features to function in a zoned environment.

Advantages of Fibre Channel

Fibre Channel offers significant speed, distance, and cost advantages. Fibre Channel works with existing systems and software, with the addition of a Fibre Channel HBA. Although current HBA drivers use SCSI commands, future HBA driver enhancements will support other protocols specified for Fibre Channel, including IP. Additional Fibre Channel enhancements are available using Fibre Channel software.

Distributed Devices

Computer and storage systems can be separated and distributed more efficiently with Fibre Channel without the addition of support servers. In contrast, SCSI requires additional servers.

When supporting distributed configurations, Fibre Channel improves disaster recovery and planning. Faster speeds and greater transmission distances allow for remotely located backup systems.

Cabling Advantages

Because Fibre Channel cabling is smaller and lighter than SCSI cables, it can run through wall conduits. Optical cables, although more expensive, carry data farther than copper and are not susceptible to electromagnetic interference. Optical cables also reduce electromagnetic radiation to help meet FCC regulations.

Addressing

Fibre Channel addressing has the following advantages over SCSI:

- Provides a larger number of addresses: 16 million (Fabric) or 127 (FC loop) compared to 16 (SCSI).
- Detects address conflicts; can automatically assign new addresses when conflicts occur.
- Tracks devices or nodes via the WWN.

During normal operations, device addresses do not change. Fibre Channel addresses can only change when device communications are disrupted. Consequently, system software does not need to spend extra time during normal operations to keep track of device addresses.

All Fibre Channel devices are identified using their WWN. The WWN is used by system software to locate devices independent of how they are connected to the system so that the software does not need to be reconfigured every time the system is reconfigured. Also, being able to track devices helps prevent losing or damaging data by accidentally accessing the wrong device in the system. This is a very important requirement for the development of the SAN (Storage Area Network) systems.

Common Problems with Fibre Channel

Fibre Channel accommodates many protocols and physical interfaces, but problems can occur with the following:

- Physical connections
- Laser power control systems
- Error recovery

Physical Connections

Physical connection problems arise from connecting devices with different types of cables, poor connections, damaged cables, or damaged connectors.

ANSI controls the cable specification. The maximum distance between devices depends on the type of cable and desired data transmission speed. As with all electrical media, Fibre Channel copper media can radiate RF interferences and can be affected by external RF noises. Because of the distance limitations and noise problems, copper media is only recommended for use inside a cabinet or rack.

NOTE

Use the optical cable(s) included with the library to connect the library to the Fibre Channel loop (host, hub, or switch).

Optical interfaces support greater distances. ANSI specifies multiple optical interfaces that use lasers, LEDs, and cable types. Generally, cables that support greater distances are more expensive than cables that support shorter distances.

Optical cable considerations include the following:

- Cable between two nodes must use the same core size.
- Three core sizes supported by Fibre Channel are 62.5 microns multi-mode up to 175 meters; 50 microns multi-mode up to 500 meters; 9 microns single mode up to 10km (with a long-wave GBIC). (These numbers are based on a 1-Gigabit per second data rate.)

NOTE

The limitation on mixing core sizes applies only to a cable between two nodes and is only a concern when splicing or connecting optical cables directly together. It does not apply when connecting through a hub or switch.

Laser Power Control Systems

Two types of systems are approved for use: OFC (Open Fibre Control) and non-OFC (recommended). These two control systems can exist on the same network, but are not optically compatible and should not be hooked up to the same optical cable.

Error Recovery

CAUTION

Fibre Channel devices are susceptible to ESD disruption from anywhere on the loop. These disruptions are related to the system environment and not an inherent failure of the hardware.

Fibre Channel systems, like LAN systems, are subject to dynamic configuration changes and data transfer disruptions. Fibre Channel can detect these disruptions, but requires error recovery procedures to continue operations. Applications using Fibre Channel should implement a more robust error recovery procedure than is needed in a SCSI environment.

D Drives and Media

Appendix Overview

This appendix contains information about the following:

- Drive Technologies and Compatibility
- Quantum DLT Drives & Media
- HP Ultrium Drives & Media

Drive Technologies and Compatibility

Format Compatibility

Table D-1 shows read and write compatibility between Quantum DLT and LTO, Linear Tape-Open, Ultrium formats.

Table D-1

Drive Format Compatibility

Drive Type	Read-Compatible	Write-Compatible
DLT 8000	DLT 4000	DLT 4000
	DLT 7000	DLT 7000
	DLT 8000	DLT 8000
LTO Ultrium	LTO Ultrium	LTO Ultrium

Media Compatibility

CAUTION

It is critical to ensure that the media you use matches the format of your tape drive. Cleaning cartridges and formatted data cartridges are unique for each drive technology. Damage may occur if inappropriate media is used in the tape drives.

Table D-2 shows drive technologies and compatible *unformatted* data cartridges.

Table D-2

Data Cartridge Compatibility (Unformatted)

Drive Type	Data Cartridge Type
Quantum DLT	DLT Type IIIXT
	DLT Type IV
HP Ultrium	HP Ultrium 200 GB

Table D-3 shows drive technologies and compatible cleaning cartridges.

Table D-3 **Cleaning Cartridges**

Drive Type	Cleaning Cartridge Type
Quantum DLT	<i>DLTtape Cleaning Cartridge only</i>
HP Ultrium	HP Ultrium Cleaning Cartridge IBM Ultrium Cleaning Cartridge

NOTE Ensure you use the correct cleaning cartridge for your tape drive. (See “Using DLT Tape Cartridges” on page D-7 and “Using HP Ultrium Cartridges” on page D-21.)

Quantum DLT Drives & Media

This section describes the following:

- DLT Drive and Media Specifications
- Using DLT Tape Cartridges
- Troubleshooting DLT Drives

DLT Drive and Media Specifications

Table D-4 DLT Drive Specifications

Description	Quantum DLT 8000
Performance	
Read/write transfer rate: maximum sustained (DLT Type IV media)	• Non-compressed mode: 6.0 MB/second • Compressed (2:1 typical): 12.0 MB/second
Burst transfer rate	20 MB/second
Average access time	60 seconds
Loading time to BOT (for previously written tape)	37 seconds (average)
Unloading time from BOT	17 seconds (average)
MTBF	250,000 hours
Interface type	• Low-Voltage Differential (LVD) Fast wide SCSI • High-Voltage Differential (HVD) Fast wide SCSI

Table D-5 **DLT Media Specifications**

Characteristic	DLT Type IV Media
Formatted capacity	<i>DLT 8000 format:</i> • 40 GB (non-compressed) • 80 GB (2:1 typical compression)
Basic description	0.5 inch (metal particle)
Tape length	557 meters (1828 feet)
Cartridge dimensions	10.4 x 10.4 x 2.5 cm (4.1 x 4.1 x 1.0 in)
Shelf life	30 years (minimum) @ 20° C 40% RH (non-condensing)
Cartridge life	• 1,000,000 passes (any point on the tape passing the recording head in either direction) • 2,000 loads/unloads
Cleaning cartridge life	20 uses

NOTE

You can also use DLT Type IIIXT media, though it has a significantly reduced capacity and performance compared to DLT Type IV media.

Using DLT Tape Cartridges

CAUTION

Quantum DLT tape drives require special cleaning cartridges and data cartridges formatted specifically for Quantum DLT. To avoid damage to your tape drive, it is critical to use appropriate DLT cleaning cartridges and properly formatted DLT data cartridges.

This section describes the following:

- Inspecting DLT Cartridges
- Write-Protecting DLT Cartridges
- Using DLT Cartridge Bar Code Labels
- Loading DLT Cartridges into a Magazine
- Using DLT Cleaning Cartridges

In addition to the information provided in this manual, refer to the documentation provided with your DLT media for more information.

Inspecting DLT Cartridges

NOTE

Make it a practice to visually inspect your tape cartridges when removing or loading them into your tape library. Taking a few minutes to check the condition of the cartridges will lower the risk of repeated failures and help ensure uninterrupted backup.

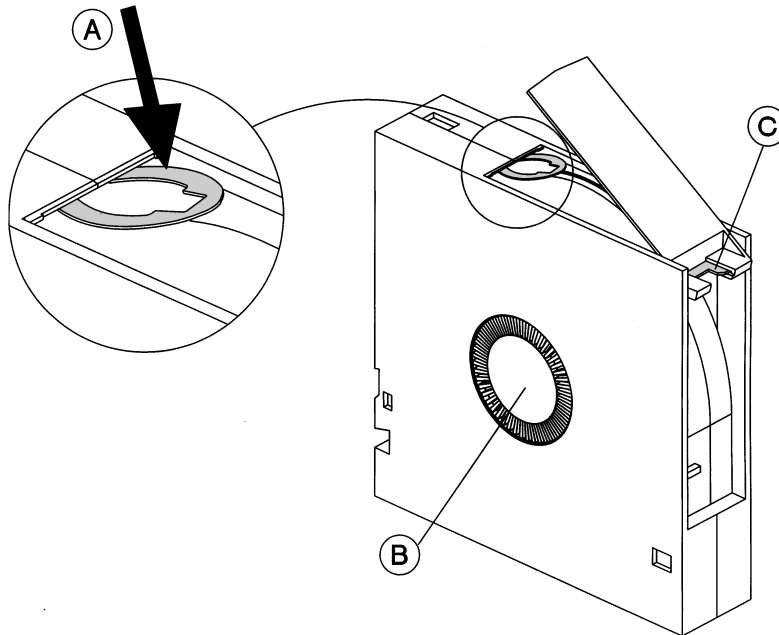
Repeated drive failures may indicate defective tapes. Tapes need to be inspected and replaced if they have been dropped, damaged, or used with a failed drive. To determine if the tapes have been damaged:

- Gently shake the tape cartridge to verify that no internal parts are rattling.
- Visually inspect the tape for a broken, unseated, or misaligned tape leader (item A in Figure D-1 on page D-8).

To check the leader position:

1. Press in the door lock (item C in Figure D-1) to release the cartridge door.
 2. While pressing in the door lock, push the tab down to open the door. Be careful not to touch the tape after opening the door.
- Verify that the spring-loaded hub (item B in Figure D-1 on page D-8) is centered within the circular opening on the bottom of the tape cartridge. Gently press the hub and make sure that it springs back into place.

Figure D-1 **Leader in Correct Position, Hub, and Door Lock Tab**



- | | |
|---|-------------------|
| A | Tape leader |
| B | Spring-loaded hub |
| C | Door lock |

Do NOT Use DLT Cartridges with:

- Tape or leaders that have been touched with bare fingers (may transfer oils to the tape head).
- Labels used on the top, bottom, sides, or back of the cartridge. Use the label slot only.

CAUTION

Always discard damaged tape cartridges. If a defective tape cartridge is loaded into a tape drive, it may in turn damage the drive, potentially requiring drive replacement.

Write-Protecting DLT Cartridges

Each cartridge has a sliding write-protect switch. Using the write-protect switch ensures data safety for files that have been previously written to tape, preventing additional files from being written to that tape.

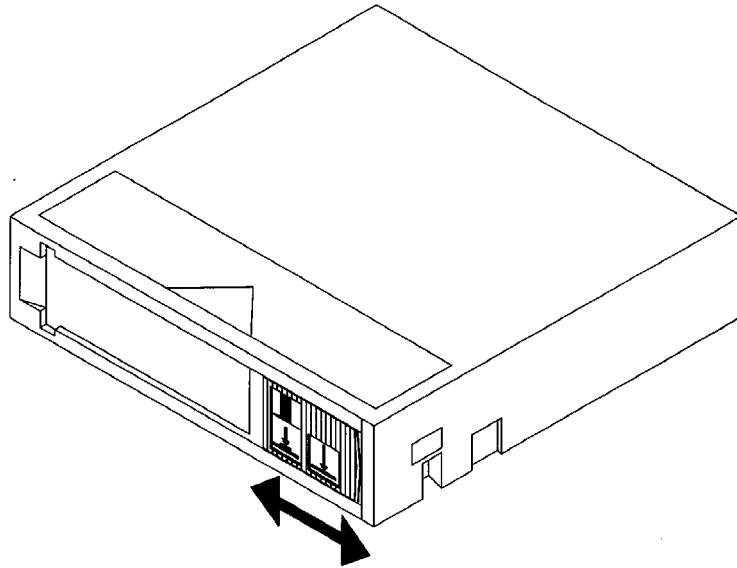
To change the write-protect setting, move the write-protect switch (Figure D-2):

- **Left** to *prevent* data from being written to the cartridge. The orange indicator on the cartridge can be seen when the write-protect switch is in the “ON” position.
- **Right** to *allow* data to be written to the cartridge. The orange indicator on the cartridge cannot be seen when the write-protect switch is in the “OFF” position.

NOTE

With the write-protect switch in either position, data can be read from the cartridge.

Figure D-2 **DLT Write-Protect Button Settings**



Using DLT Cartridge Bar Code Labels

Make it a practice to use bar code labels on your tape cartridges. Your host software may need to keep track of the following information and the associated bar code:

- Date of format or initialization
- Cartridge owner (such as a group or department)
- Storage purpose

TIP

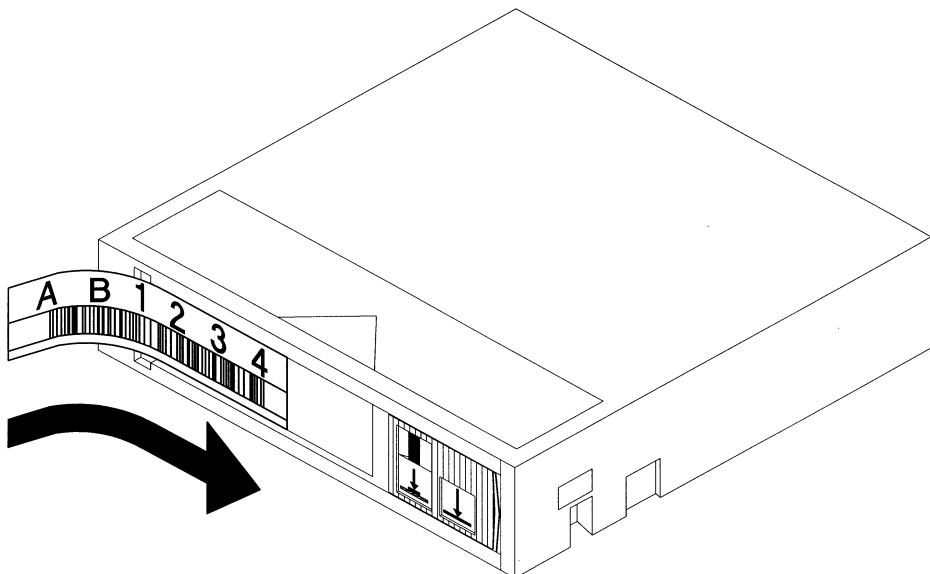
If the host software does not keep track of this information, create a method for doing so.

DLT cartridges have a front slide slot located on the face of the cartridge next to the write-protect switch. Use this slot for inserting the bar code label by sliding it into the slot (Figure D-3).

CAUTION

Do not apply labels onto the top, bottom, sides, or back of the cartridge as this may cause damage to the tape drive or interfere with reliable operation.

Figure D-3 **Proper DLT Label Position**



DLT Cartridge Bar Code Specifications

Description	Specification
Data Cartridge Message	6-character: 2 alpha, 4 numeric, (AAnnnn)
Cleaning Cartridge Message	6-character: 'CLN', 3 numeric (CLNnnn)
Dimensions	5.6 cm x 2.1 cm (2.2 in x .82 in)
Symbology	code 39 without check digit
Start/Stop Characters	*/*
Narrow Bar	0.036 cm (0.014 in)
Ratio	2.5:1
Print Quality	ANSI Grade "A"

NOTE

You can order additional bar codes if needed. Bar code ordering information is provided with your tape library.

Using DLT Cleaning Cartridges

DLT drives should only be cleaned if the *clean drive* icon displays on the tape library status bar. Only use the appropriate DLT cleaning cartridges and follow the instructions on page 2-17. In general, replace DLT cleaning cartridges after twenty uses. Marking the label on the cleaning cartridge after each use will help you keep track of the number of uses.

CAUTION

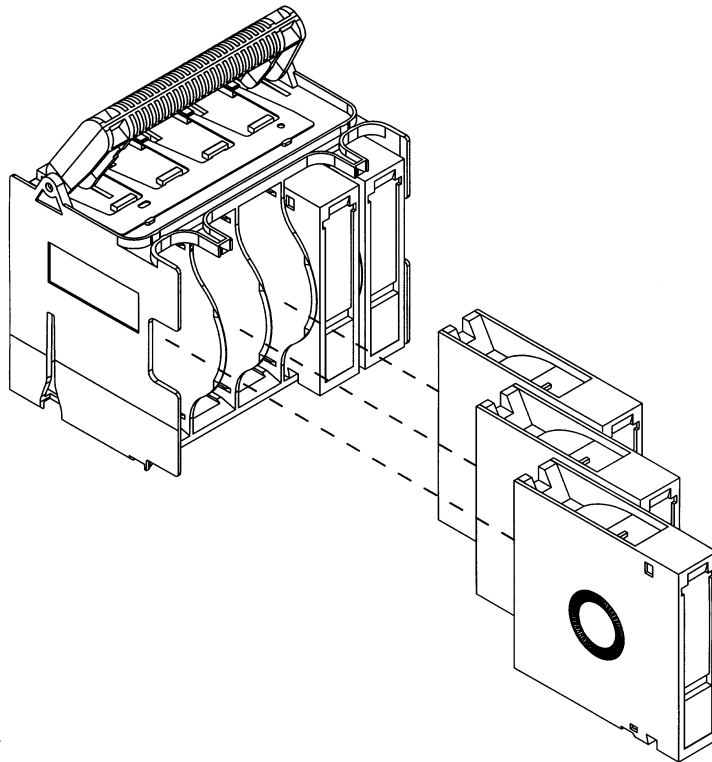
Excessive use of the cleaning cartridge can cause unnecessary wear on the drive head. The tape library front panel will display a message when the DLT cleaning cartridge needs to be replaced.

See "DLT Cleaning Issues" on page D-17 for information on troubleshooting common cleaning problems.

Loading DLT Cartridges into a Magazine

When inserting DLT cartridges into the tape library magazine, ensure that each cartridge is positioned with the write-protect switch facing out of the magazine and away from the magazine handle (Figure D-4). Push the tape into the slot until it “clicks” into place.

Figure D-4 Loading DLT Tapes into a Magazine



Troubleshooting DLT Drives

This section describes the procedures for troubleshooting DLT drives, including:

- Manually Rewinding a Stuck Tape
- Removing a Stuck Tape
- DLT Cleaning Issues
- Media Issues

Refer to Chapter 4 for information on troubleshooting performance issues or other problems you may encounter. If you experience problems not covered by these manuals, contact your support representative.

NOTE

For information on upgrading drive firmware, see page 4-60.

Manually Rewinding a Stuck Tape

NOTE

Before manually rewinding a stuck tape, attempt to eject the tape using the tape library front panel, remote management card Web-Based Library Administrator pages, and your host backup software.

Before manually rewinding a stuck tape, you must first remove the drive module from the tape library. Refer to “Removing a Drive Module” on page 4-56.

After removing the drive module, view the drive hub through the clear plastic to determine if the tape has been rewound. If the tape has not been rewound, follow the steps below and refer to Figure D-5 on page D-15:

CAUTION

The DLT drive does not automatically eject a cartridge if a power failure occurs.

1. Place the DLT drive module on its top side so that the bottom of the drive module is facing up.
2. Insert a Phillips #2 screwdriver in the rewind hole on the bottom of the drive module and engage the screw.

NOTE

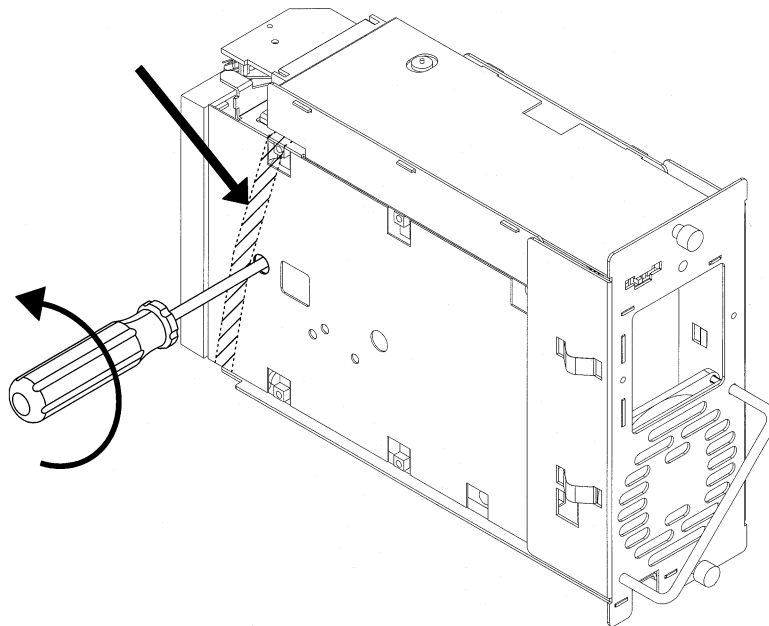
Gently move the ribbon cable to one side of the rewind hole if necessary.

3. Turn the screwdriver counter-clockwise to rewind the tape. Continue rewinding until the leader is seated in the tape cartridge.

CAUTION

Do not use a power screwdriver as damage may result to the tape.

Figure D-5 **Rewinding a Tape in the DLT Drive Module**



Removing a Stuck Tape

Use the following procedure and Figure D-6 to remove a tape stuck in a DLT drive module:

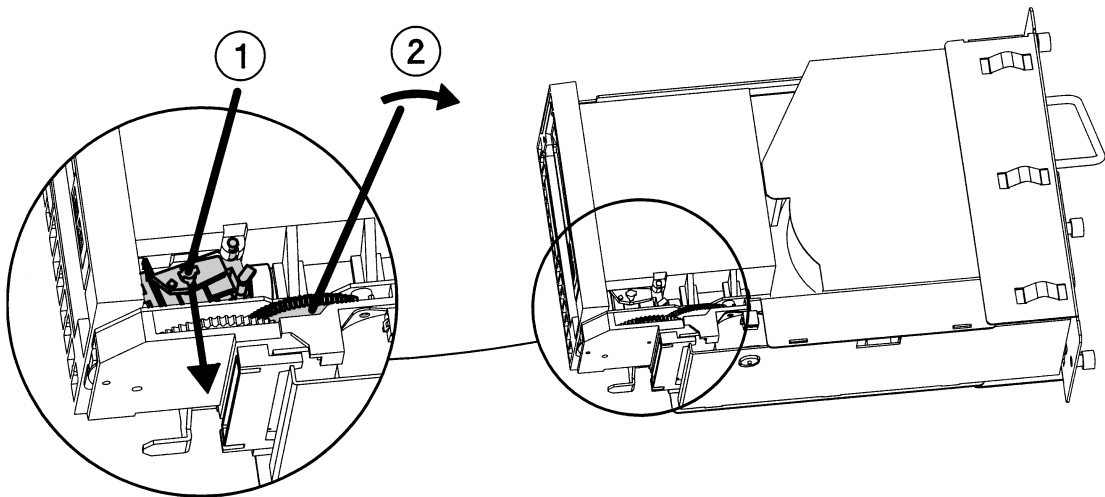
1. Locate the spring-loaded latch near the opening on the drive module, and push it outward (item 1 in Figure D-6). Ensure that you move both parts of the latch.
2. While holding the latch outward, rotate the thumb-wheel (drive gear) until the tape ejects (item 2 in Figure D-6).

NOTE

If turning the thumb-wheel does not eject the tape, or if you encounter high resistance in turning the thumb-wheel, check to ensure that the spring-loaded latch has been rotated outward.

3. Verify the tape is not damaged (see “Inspecting DLT Cartridges” on page D-7).

Figure D-6 **Spring-Loaded Latch and Thumb-Wheel**



DLT Cleaning Issues

Table D-6 describes situations you may encounter with cleaning cartridges and how to resolve them.

Table D-6 **DLT Cleaning Issues**

Problem	Solution
Recurring cleaning message.	• If the message reappears after cleaning the drive, the front panel display will indicate the need to replace the cleaning cartridge. • Replace the existing cleaning cartridge with a new one. • If the message reappears when a particular data cartridge is used, verify that the data cartridge is readable by: — Clearing the error message. — Reading the tape again. • If the data cartridge can be read, backup data from the damaged cartridge to another cartridge, and discard the damaged one.
A brand new data cartridge is used and the <i>clean drive</i> icon is displayed.	• Clean the outside of the data cartridge using a damp cloth. • Clean the drive using the drive cleaning procedure on page 2-17. • If the icon is displayed again within a short amount of time, replace the data cartridge.
Cannot load the cleaning cartridge.	• Ensure the cleaning cartridge matches your drive type. Cleaning cartridges are unique for each drive technology.

Media Issues

Table D-7 describes situations you may encounter with media and how to resolve them.

Table D-7

Media Issues

Problem	Solution
Cannot load tape into drive.	Ensure your media and format type matches your drive type. (See “Using DLT Tape Cartridges” on page D-7.)
Tape has circular wear patterns around the hub.	The drive hub may not be engaging the tape hub properly. Discard the tape and contact your support representative.
Error message appears: “Drive rejected load of tape” (error code 101, qualifier 65 H).	Retry the operation. If you continue to get this error, replace the tape cartridge. If data recovery is needed, contact your support representative.

HP Ultrium Drives & Media

This section describes the following:

- DLT Drive and Media Specifications
- Using DLT Tape Cartridges
- Troubleshooting DLT Drives

HP Ultrium Drive and Media Specifications

Table D-8 Ultrium Drive Specifications

Description	HP Ultrium
Performance	
Read/write transfer rate: (maximum sustained)	• Non-compressed mode: 15 MB/second • Compressed (2:1 typical): 30 MB/second
Burst transfer rate	80 MB/second
Average access time	90 seconds
Loading time	25 seconds (maximum)
Unloading time	13 seconds (maximum)
MTBF	250,000 hours
Interface type	• Low-Voltage Differential (LVD) Ultra 2 SCSI • High-Voltage Differential (HVD) Ultra SCSI

Table D-9 Ultrium Media Specifications

Characteristic	Ultrium Media
Formatted capacity	200 GB (2:1 typical compression)
Basic description	0.5 inch (metal particle)
Tape length	580 meters (1903 feet)
Cartridge dimensions	10.2 x 10.5 x 2.2 cm (4.02 x 4.15 x 0.85 in)
Shelf life	30 years
Cartridge life	1,000,000 passes 20,000 loads/unloads
Cleaning cartridge life	15 uses

NOTE

Only use approved Ultrium cleaning cartridges with HP Ultrium tape drives (see page D-4). For data cartridges, only use those specified as having met Ultrium standards. Approved media will have the Ultrium format trademark (Figure D-7), which indicates that the media has passed Ultrium format compliance testing. For best results, always use HP branded media.

Figure D-7 Ultrium Format Trademark



Using HP Ultrium Cartridges

CAUTION

HP Ultrium tape drives require special cleaning cartridges and data cartridges formatted specifically for HP Ultrium. To avoid damage to your tape drive, it is critical to use appropriate cleaning cartridges and properly formatted data cartridges.

A unique feature of Ultrium tape cartridges is LTO-Cartridge Memory (LTO-CM). LTO-CM is an intelligent memory chip embedded into the cartridge. It uses a radio frequency interface that eliminates the need for a physical power or signal connection between the cartridge and drive. Information normally stored in the header at the beginning of the tape is contained in the LTO-CM, including identification and usage information such as the number of times the cartridge has been loaded, when it was last cleaned, and error logs.

See the following sections for information on:

- Inspecting DLT Cartridges
- Write-Protecting DLT Cartridges
- Using DLT Cartridge Bar Code Labels
- Loading DLT Cartridges into a Magazine
- Using DLT Cleaning Cartridges

In addition to the information provided in this manual, you may also want to refer to the documentation provided with your Ultrium media.

Maintaining Ultrium Cartridges

Make it a practice to visually inspect your tape cartridges when loading or removing them from your tape library. Taking a few minutes to check the condition of your cartridges will lower the risk of repeated failures and help ensure uninterrupted backup.

Do not apply more than one label onto Ultrium cartridges, as extra labels can cause the cartridges to jam in the tape drive.

CAUTION

Do not bulk erase Ultrium formatted cartridges. This will destroy pre-recorded servo information and make the cartridges unusable.

Write-Protecting Ultrium Cartridges

Each cartridge has a sliding write-protect switch. Using the write-protect switch ensures data safety for files that have been previously written to tape, preventing additional files from being written to that tape.

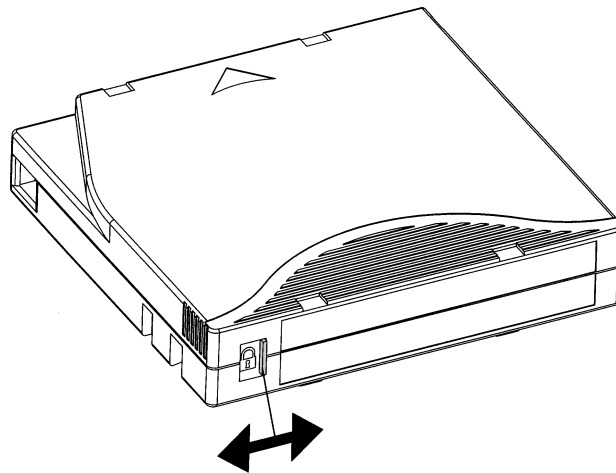
To change the write-protect setting, slide the red tab on the base of the cartridge (Figure D-8 on page D-22):

- **Right** to *prevent* data from being written to the cartridge. The red tab on the cartridge displays a padlock when the write-protect switch is in the “ON” position.
- **Left** to *allow* data to be written to the cartridge (unless the tape is write-protected electronically through your backup software). The padlock on the red tab cannot be seen and the hole is exposed when the write-protect switch is in the “OFF” position.

NOTE

With the write-protect switch in either position, data can be read from the cartridge.

Figure D-8 **Ultrium Write-Protect Button Settings**



Using Ultrium Cartridge Bar Code Labels

Make it a practice to use bar code labels on your tape cartridges. Your host software may need to keep track of the following information and the associated bar code:

- Date of format or initialization
- Cartridge owner (such as a group or department)
- Storage purpose

TIP

If the host software does not keep track of this information, create a method for doing so.

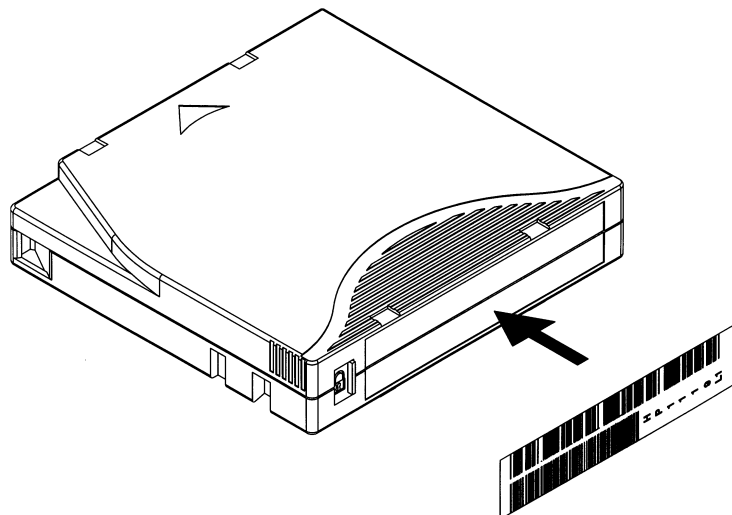
Ultrium cartridges have a recessed area located on the face of the cartridge next to the write-protect switch. Use this area for attaching the bar code label (Figure D-9). Do not apply labels onto the cartridge except in this designated area.

CAUTION

The bar code label should be applied as shown in Figure D-9 with the alphanumeric portion facing the hub side of the tape cartridge. Never apply multiple labels onto a cartridge, as extra labels can cause the cartridge to jam in a tape drive.

Figure D-9

Proper Ultrium Label Position



NOTE

You can order additional bar codes if needed. Bar code ordering information is provided with your tape library.

Table D-10 **Ultrium Cartridge Bar Code Specifications**

Description	Specification
Data Cartridge Message	8-character: 6 alphanumeric (user preference) followed by 2 alphanumeric (media ID)
Cleaning Cartridge Message	8-character: 'CLN', 'H', 2 numeric, and 2 alphanumeric (media ID)
Dimensions	7.8 cm x 1.7 cm (3.07 in x 0.67 in)
Symbology	code 39 without check digit
Start/Stop Characters	*/*
• Short Bar • Long Bar	• 6.0 mm (0.24 in) • 8.5 mm (0.33 in)
Ratio	2.75:1
Print Quality	ANSI Grade "A"

NOTE

For data cartridge messages, 'n' represents the volume serial number (or volser), and 'XY' represents the media ID. The HP Ultrium media ID is 'Lg' where 'g' (alphanumeric) designates a generation of the cartridge. For example, the HP Ultrium media ID for first generation data cartridges is 'L1'.

For cleaning cartridge messages, 'CLN' denotes that it is a cleaning cartridge, 'H' represents Hewlett-Packard as the drive manufacturer, 'n' is the volume serial number, and 'XY' represents the media ID (as stated above). Bar codes will resemble 'CLNHnnL1'.

Using Ultrium Cleaning Cartridges

HP Ultrium drives should only be cleaned if the *clean drive* icon displays on the tape library status bar. Only use appropriately formatted data cartridges and approved cleaning cartridges, and follow the instructions on page 2-17. In general, replace cleaning cartridges after fifteen uses. Marking the label on the cleaning cartridge after each use will help you keep track of the number of uses.

CAUTION

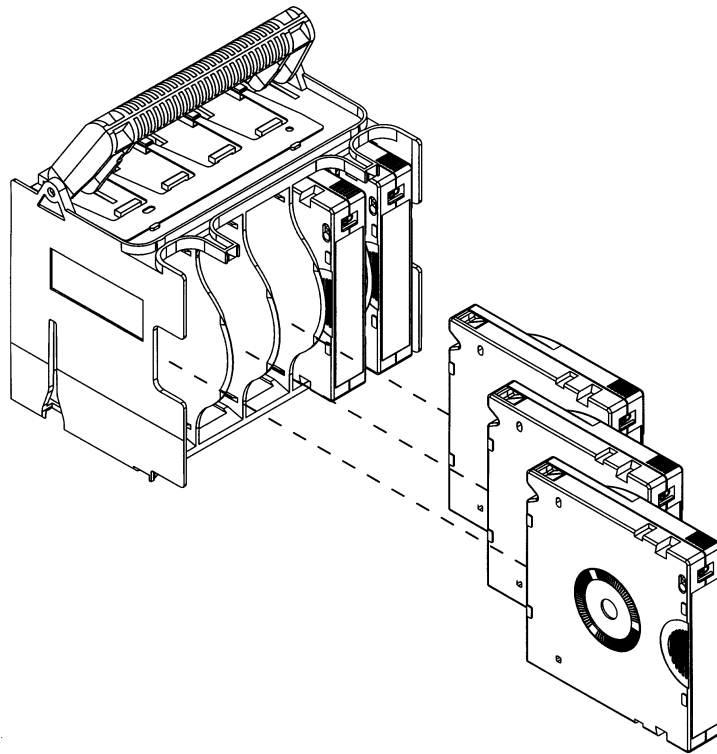
Excessive use of the cleaning cartridge can cause unnecessary wear on the drive head. The tape library front panel will display a message when the cleaning cartridge needs to be replaced.

See “Ultrium Cleaning Issues” on page D-28 for information on troubleshooting common cleaning problems.

Loading Ultrium Cartridges into a Magazine

When inserting Ultrium cartridges into the tape library magazine, ensure that each cartridge is positioned with the write-protect switch facing out of the magazine and towards the magazine handle (Figure D-10). Push the tape into the slot until it “clicks” into place.

Figure D-10 **Loading Tapes into a Magazine**



Troubleshooting HP Ultrium Drives

This section describes troubleshooting information for Ultrium drives, including:

- Rewinding/Removing a Stuck Tape
- Ultrium Cleaning Issues
- LTO-Cartridge Memory (LTO-CM) Issues

Refer to Chapter 4 for information on troubleshooting performance issues or other problems you may encounter. If you experience problems not covered by these manuals, contact your support representative.

NOTE

For information on upgrading drive firmware, see page 4-60.

Rewinding/Removing a Stuck Tape

If a tape gets stuck in the drive, attempt to eject the tape using:

- Tape library front panel
- Remote management card Web-Based Library Administrator pages
- Host backup software

If these attempts are not successful, contact your support representative.

Ultrium Cleaning Issues

Table D-11 describes potential issues with cleaning cartridges and how to resolve them.

Table D-11 **Ultrium Cleaning Issues**

Problem	Solution
Recurring cleaning message.	• If the message reappears after cleaning the drive, the front panel display will indicate the need to replace the cleaning cartridge. • Replace the existing cleaning cartridge with a new one. • If the message reappears when a particular data cartridge is used, verify that the data cartridge is readable by: — Clearing the error message. — Reading the tape again. • If the data cartridge can be read, backup data from the damaged cartridge to another cartridge, and discard the damaged one.
A brand new data cartridge is used and the <i>clean drive</i> icon is displayed.	• Clean the outside of the data cartridge using a damp cloth. • Clean the drive using the drive cleaning procedure on page 2-17. • If the icon is displayed again within a short amount of time, replace the data cartridge.
Cannot load the cleaning cartridge.	• Ensure the cleaning cartridge matches your drive type. Cleaning cartridges are unique for each drive technology.

LTO-Cartridge Memory (LTO-CM) Issues

The LTO-CM stores information that is normally stored in the header at the beginning of the tape, including identification and usage information such as the number of times the cartridge has been loaded, when it was last cleaned, and error logs. If the LTO-CM becomes damaged, you may experience difficulty with the cartridge.

Table D-12 LTO-CM Issues

Problem	Cause	Solution
A new data cartridge that is write-enabled is rejected by the drive.	LTO-CM has failed or is damaged.	Replace data cartridge.
A new data cartridge that is write-protected is rejected in multiple known good drives.	LTO-CM has failed and the drive has found no data to recover.	Replace data cartridge.
A cartridge that has data written to it and is write-enabled is rejected by the drive.	LTO-CM has failed or is damaged.	The data can still be recovered. Contact your support representative for more information. After data recovery, replace the cartridge.
A cartridge that has data written to it and is write-protected restores very slowly.	LTO-CM has failed and the drive cannot use the tape directory information to recover the data.	The data can still be recovered, but may take longer than normal.

Glossary

A

AL_PA Arbitrated loop physical address

B

backup software Software that runs on the host computer that is used to track data backups and execute library functions.

board A printed circuit assembly (PCA). Also called a card or adapter.

bulk load A way to load magazine slots with tapes. Usually refers to the initial loading of the library.

bus A common data path over which data is transported.

C

calibration A routine that is run immediately after a tape cartridge is loaded, in order to determine if the tape is blank or written, compatible with the drive, and capable of being written and read.

cleaning tape A tape that is used only for cleaning a drive.

D

drive, tape drive The device that the library uses to record data onto tapes.

drive cleaning A library feature that uses a cleaning tape to clean a tape drive.

drive module The entire assembly that houses the drive, including the metal housing and connectors.

differential SCSI A type of SCSI cable that can carry data a maximum of 25 meters.

E

event A significant function of the library displayed in the event log that reports drive errors, online/offline transitions, drive cleaning, and other information.

F

fabric Switched interconnect methodology that supports high-speed data routing in Fibre Channel networks.

Fibre Channel A switched protocol that allows concurrent communication among workstations, supercomputers, mainframes, data storage devices, and other peripherals. Fibre Channel is capable of transmitting at rates exceeding one gigabit per second in both directions simultaneously.

Fibre Channel Arbitrated Loop (FC-AL) Topology that provides a low-cost solution for attaching multiple Fibre Channel ports in a loop without switches.

front panel display An LCD (liquid crystal display), equipped with five soft keys, mounted on the front of the library (top level on multi-level libraries) that controls all library functions.

G

GBIC Gigabit Interface Converter

H

hard errors Electronic errors in library functions that cannot be recovered. These errors are recorded in the hard error log. May also be referred to as host interface card.

HBA Host Bus Adapter - A circuit board residing in the host system that handles requests to and from the host system and the library. May also be referred to as a host interface card.

home screen The view on the front panel display that provides status information after the library has been powered on. Also, the default view to which the display returns after being left idle after approximately three minutes.

host One or more computers that generate and communicate data to the library.

hub A device that provides a multiple port loop interconnect system to implement a Fibre Channel arbitrated loop using a physical “star” configuration.

HVDS High Voltage Differential SCSI

I

identity A front panel display option that provides the library’s serial number.

IP Internet Protocol

J

jumper cables Cables used to connect the library controller card to a drive. May also be referred to as daisy-chain cables.

L

latch stop A spring-loaded device that protrudes through the mounting rail. The latch stop allows the library to be pulled approximately two-thirds out of a rack, but prevents it from being pulled all the way out.

LEDs Light-emitting diodes, also called lamps, found in various library assemblies, including drive modules, power supplies, library cards, and internal assemblies. An LED communicates status information about the assembly.

library A data storage system that stores electronic data on tape media. Depending on the model, the library can use up to six drive modules.

LTO Linear Tape-Open

LVDS Low Voltage Differential SCSI

M

MAC Address Media access control address - a unique hardware-based address that identifies each node on a network.

magazine A slotted container that resides in the tape drawers that provides individual slots for five tape cartridges.

magazine access A process of loading or unloading tapes that involves opening a tape drawer and exchanging one or more magazines.

mailslot A process of loading or unloading tapes that allows the user to access either one, five, or ten storage slots.

move A single library action, such as loading a tape into a drive, or unloading a tape from a drive.

N

nesting The menu approach implemented in the library that uses increasing levels of library control.

O

odometer A front panel option that displays the odometer logs for power-on hours and moves.

originator A Fibre Channel term that refers to the initiating device.

P

port The hardware entity within a node that performs data communications.

power (stand-by) switch A low holding voltage remains in the library even though library has been powered off.

R

RMC, remote management card A circuit card that provides the ability to gain access to the library from a computer at a different location.

S

SCSI Small Computer Systems Interface - A bus that transfers data between the host system and the library.

SCSI ID The electronic identification number for each SCSI device in the library. The library SCSI devices are the drives and the library interface controller card.

SCSI element reservation This allows the host to continue reserving drive or slots after a power cycle. This is typically used to ensure that only one host can access a slot or drive.

single-ended SCSI A type of cable that is limited to short distances.

soft error Electronic errors in library functions that can be recovered. These errors are recorded in the soft error log.

soft keys Five buttons located along the bottom edge of the front panel display that are used to execute commands on the display.

swap Two related library actions, or moves, such as moving a tape from a slot to a drive, and then back to a slot.

switch A device that provides a (n by n) interconnect to allow a port to have full communication bandwidth with any other port while other communications are occurring.

T

tape, tape cartridge The media that the library uses for recording data from the host computer(s).

TCP/IP Transmission Control Protocol/Internet Protocol

terminator An electronic device that connects to the end of the SCSI bus to stabilize bus signals.

U

UTC Coordinated Universal Time

W

web-based library

administrator Describes the interface that allows you to monitor and manage the library over the network via the remote management card.

wide SCSI A 68-pin connector that can be single-ended or differential in implementation.

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